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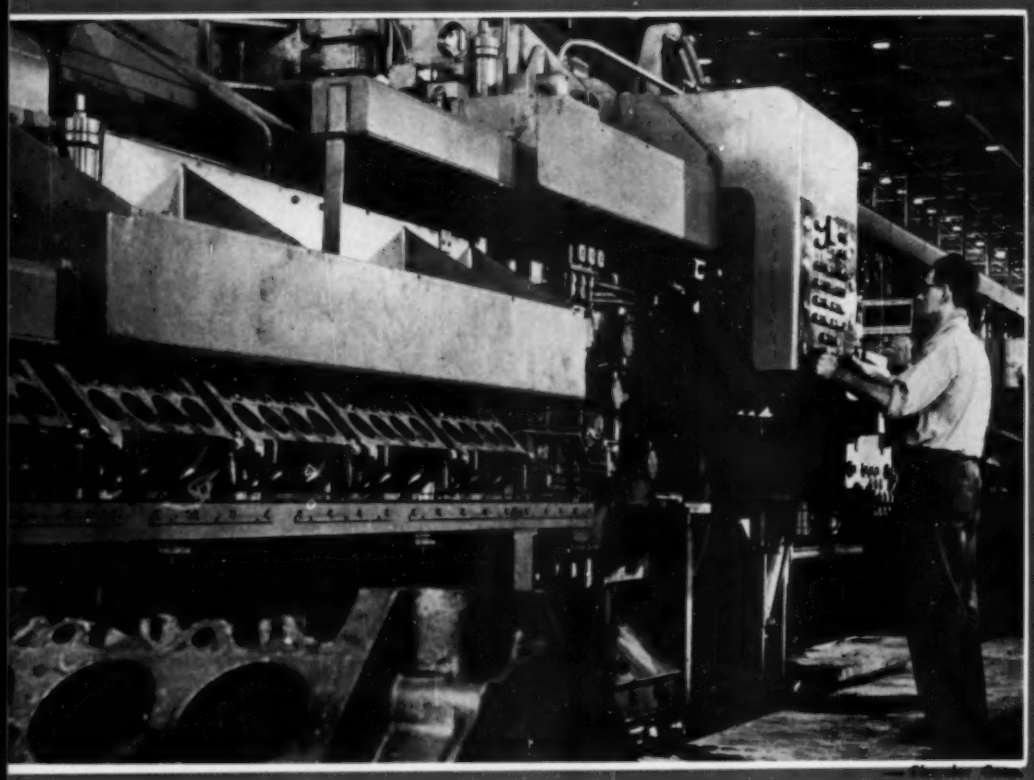
INDUSTRIAL ARTS AND VOCATIONAL EDUCATION



what
the world of
automation
means to
industrial arts
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- ☐ A Review of "Industrial Arts — An Analysis of 39 State Curriculum Guides: 1953–1958" (pg. 8)
- ☐ How to Use a Flannelboard, Barnard (pg. 26)
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November, 1961

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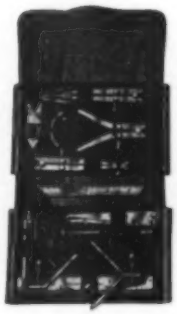

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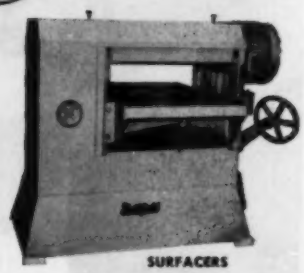

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INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

November, 1961 Vol. 50, No. 9

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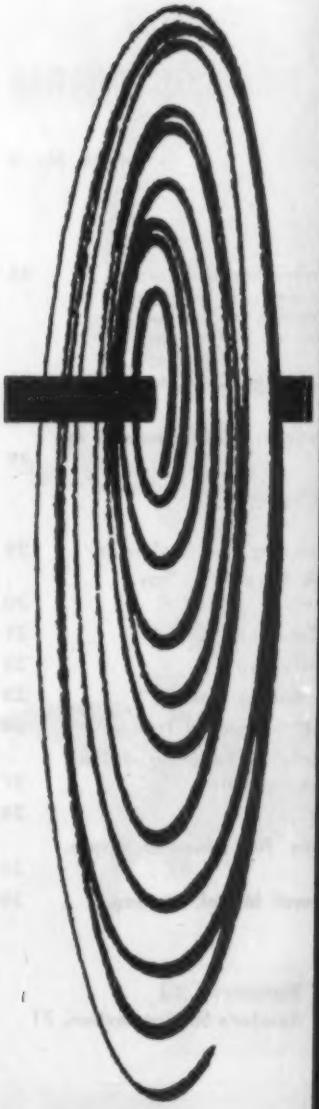

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news

The **dropout problem and its implications for industrial education received increased attention** recently when Sterling M. McMurrin, U. S. Commissioner of Education, urged "the co-operation of all citizens in a nation-wide effort to encourage young people to complete their schooling." About 20 per cent or two and one-half million of the 10,800,000 students to be enrolled in grades 9 through 12 of the nation's schools this fall will drop out before graduation. Dr. McMurrin referred to recent surveys indicating that sizable percentages of school-leavers have "average intelligence." He blamed the majority of these academic casualties on poor guidance or parental indifference.

A survey of the National Council of Jewish Women indicated that a lack of motivation as the reason cited for dropping out almost as often as economic need. "Youngsters stated that they were not learning anything in school that would help them on the job." The report indicated a need for more effective "school guidance and vocational training programs." □

The **James F. Lincoln Arc Welding Foundation has announced the winners in its annual $15,000 arc-welding competition for high school students.** In the industrial arts division, the first award winner of $746 was John M. Johnson of Lake Nebagamon, Wis., whose entry was a crawler trailer built as a student at Northwestern High School under the guidance of his instructors, Donald L. Olson and Howard Prell. A total of 249 boys from 35 states and Puerto Rico won awards which are open to vocational-industrial and vocational-agricultural students in three divisions. Awards are made on the basis of usefulness of the project, the ability and ingenuity shown in the construction and design, and the clarity and completeness with which the project is described and illustrated in the entry. □

Steps to **strengthen the industrial arts program in the Urbana,** Ill., schools by the district's director, John Robertson, include a pre-engineering drafting course in the senior high school, a graphic arts unit in the junior high school, and a power mechanics course on the secondary level. In reviewing Mr. Robertson's recommendations, one board member commented that: "It is gratifying to see studies made in the field of industrial arts . . . we should take pride in graduating persons going into trades as well as those going into higher education." □

The **University of Michigan at Ann Arbor has announced its schedule of conferences** and institutes for industrial educators for the 1961–62 school year: for woodwork on Nov. 11; for general shop, on Feb. 24; on auto mechanics, on Mar. 17; and on machine shop, Mar. 31. For additional information, contact Ralph C. Wenrich, chairman, department of vocational education and practical arts. □

The **ninth annual Ball State Industrial Arts Conference** will be held on Saturday, November 18, on the Ball State Teachers College Campus in Muncie, Indiana. The theme of the conference will be "New Dimensions In Industrial Arts." The major emphasis of this one-day conference will be upon the future of industrial arts. □

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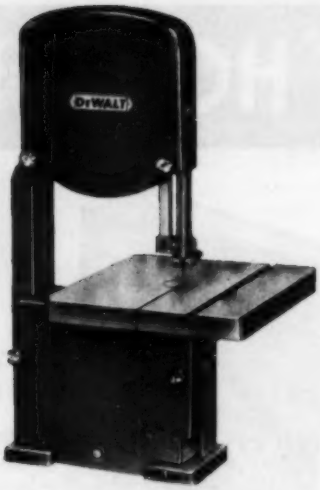

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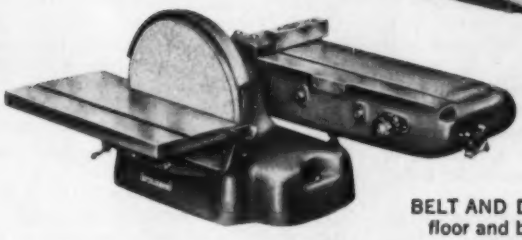

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The Industrial Arts Curriculum

What instructional topics are recommended for the seven basic subject areas of industrial arts education by state curriculum guides is reported in the Office of Education's new booklet, "Industrial Arts: An Analysis of 39 State Curriculum Guides, 1953–58."[1] This study has three purposes:

1. To analyze the instructional content reported in state curriculum guides in selected subject areas of industrial arts at the junior high school level (grades 7, 8, and 9) and the senior high school level (grades 10, 11, and 12).

2. To illustrate with representative examples the instructional content in the state curriculum guides for industrial arts, including with each example a summary of the state organizational pattern for industrial arts.

3. To determine the main elements which make up the curriculum guides.

The authors state, by way of introduction, that "This study provides basic data related to the nature, scope, and sequence of industrial arts education in the public schools of the United States. It is basic to the curriculum area of industrial arts. Specially, it will provide a bench mark for the identification of trends and provide primary source materials for personnel engaged in curriculum improvement at state and local levels. The study also will provide a base on which intelligent decisions can be made to determine the direction industrial arts should take in the years ahead."

The report is divided into three main chapters: (1) instructional content analysis; (2) content presentation, patterns of organization, and main elements; and (3) summary, conclusions, and suggestions.

The First Chapter

The first chapter on "Instructional Content Analysis" reports on delimitations, basic assumptions, procedures used in the content analysis, related research, the rationale for the study, and inferences derived from the analysis. Table 2 in this chapter — consisting of 22 pages — outlines the instructional topics (and their frequency of mention) in woodworking, metalworking, electricity and radio (electronics), graphic arts, transportation and power mechanics, and plastics.

Among the "influences derived from the analysis" were included the observations that:

1. In some I-A areas, "no consistent patterns of content materials which indicated a well-defined scope of subject matter."

2. "Little evidence that the instructional content of the curriculum guides reflected a developmental sequence of subject matter."

3. Several states "are faced with a complexity of organization of industrial arts laboratories which makes successful organization of a curriculum extremely difficult" —

4. "Very little agreement as to the grade placement of particular content or the activities that are appropriate to it."

5. "A tendency for groups of contiguous states to develop guides which were similar in organization and content, although not published at the same time."

6. And in several states "nonadjacent to each other" the organization and content recommendations "had considerable resemblance."

7. "A number of guides utilized the same basic content" as the 1945 and 1953 editions of the AVA's "A Guide to Improving Instruction in Industrial Arts."

8. Many publications "were developed by an 'analysis approach' " with content, however, "judgmental in nature with a prevocational-type emphasis."

9. "The common organizational format involved operational skills and information" — with the latter of a general related, general technical, or guidance nature.

10. There seemed to be no attempt to direct the guide content toward "a pupil-centered, a socially oriented, or a problem based approach to curriculum building."

11. A difference between apparent direction of some stated objectives (behavioral) and the companion content (prevocational).

12. "Few significant attempts toward the promotion of methodology, involving group activities, problem-solving, experimentation, research, and the like."

13. The content suggested was ordered about the nature of a material, such as, wood, metal, etc., and its manufacture or "processing" in almost every instance.

14. The significant differences were "few in number" — with the exception of regional characteristics, such as leathercraft in the western United States and the inclusion of farm shop content in agricultural areas.

[1]Schmitt, Marshall L., Harrison, Paul E., and Pelley, Albert L. "Industrial Arts: An Analysis of 39 State Curriculum Guides, 1953–58." Bulletin 1961, No. 17. Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Paper, 76 pp., 45 cents.

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Make a working drawing	9	11	7	11
LAYOUT				
Draw stock and lay out designs on stock	17	152	14	143
Measurement	13	23	11	21

An excerpt from Chapter I of the OE booklet indicating frequency of mention of instructional topics in state guides. The first and third columns indicate the number of states and guides noting topics in junior and senior high school years, respectively; the second and fourth columns indicate the number of times reported.

The Second Chapter

The first part of Chapter II on "content presentations, patterns or organization, and main elements" of the state I-A guides presents "representative examples of how the instructional content is presented in the curriculum guides with a summary of the state organizational pattern for industrial arts." The states and areas selected are California, metals; Idaho, woodworking; Maine, transportation; Minnesota, communications; Missouri, all areas; Nebraska, drawing and planning; New Jersey, plastics; New York, general electricity; Texas, graphic arts; Virginia, woodworking.

This section of the booklet attempts to relate specific subject areas of 10 states to the over-all organizational pattern of the state's industrial arts departments, as well as to relate how the instructional content is presented in the guides.

An example of this analysis is taken from New Jersey:

"A guide for planning school facilities for the junior and senior high school in industrial arts is based on five general laboratories, and including six activities in one industrial arts laboratory. For example, General Laboratory I, would have activities in wood, leather, plastics, ceramics, home mechanics, and textiles. General Laboratory II would have machine shop, art metal, ornamental iron, sheet metal, and foundry. General Laboratory III would have electricity, internal combustion engine, refrigeration, radio and television. General Laboratory IV would have printing, silk screen, bookbinding, rubber stamp, block-printing, and photography. General Laboratory V would have agriculture arts.

"The instructional content suggested in New Jersey for elementary grades 5, 6, 7, and 8 is: grade 5 — wood, metal, leather, and plastics; grade 6 — wood, metal, leather, plastics, and electricity; grade 7 — wood, metal, leather, plastics, electricity, mechanical drawing, ceramics, and home mechanics; and grade 8 — wood, metal, leather, plastics, electricity, mechanical drawing, ceramics, and home mechanics.

"Additional areas may be included in an elementary industrial arts program: weaving, knotwork, beadwork, basketry, shell craft, metal enameling, jewelry, foundry, metal spinning, electroplating, lapidary, wood carving, whittling, wood burning, model planes and ships, upholstering, archery, bookbinding, silk screen work, block-printing, photography, and keene cement work.

"The format used in the presentation of each area includes five units: (1) tools and

(Concluded on page 10)

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I-A CURRICULUM

(Concluded from page 8)

equipment, (2) materials and supplies, (3) skills and processes, (4) related information, and (5) suggested projects. An excerpt of the format of the curriculum guide is shown as follows for the 'plastics' area.

"UNIT I — TOOLS AND EQUIPMENT:
- A. Rule
- B. Try square
- C. Coping saw
- D. Back saw
- E. Files
- F. Hand drill
- G. Prick punch

"UNIT II — MATERIALS AND SUPPLIES:
- A. Assorted plastic sheets
- B. Assorted plastic rods
- C. Special shaped plastics:
  1. Hearts
  2. Rings
  3. Cross
  4. Animals
- D. Abrasive papers
- E. Polishing compounds

"UNIT III — SKILLS AND PROCESSES:
- A. Prepare, measure, and lay out designs
- B. Cut designs with saws
- C. Use hand drill
- D. Use files to dress edges
- E. Use abrasive papers to smooth edges
- F. Include hand polish project

"UNIT IV — RELATED INFORMATION:
- A. Types and uses of common plastics

"UNIT V — SUGGESTED PROJECTS:
- A. Napkin holders
- B. Shade pulls

The second part of Chapter II reports the main elements of the guides.

The final chapter, with summary, conclusions, and suggestions, represents a valuable section of the booklet. The conclusions include two about the instructional content recommended by the guides:

1. The instructional topics most emphasized include project planning, hand-tool techniques and machine processes, technical information dealing with properties of materials and industrial processes, and occupational information.

2. "Less emphasis is placed upon topics that relate to modern industrial developments and problems, such as, automation jigs and fixtures, and other mass production devices, practices, consumer problems, new products, and processes (such as, semi-conductors, atomic-electric plant), and human relationships."

The suggestions of the final chapter deserve considerable attention from all industrial educators. (For an evaluation of these suggestions, see "The Editor's Stand" on page 17 of this issue of your IA/VE.)

The suggestions are based upon an examination of the role of industrial arts in general education and what the learner should develop from I-A courses in our technological society. Particularly, the authors highlight the fact that the student, as a result of his "self-exploratory" industrial arts experiences, should be able "to assess his latent abilities so as to determine a future course of action."

To accomplish this — "to bring about more fully these wholsome changes in behavior of the learner" — "a redirection and re-emphasis should be made in the industrial arts curriculum area." This improvement should consist of greater stress on (1) "project planning or student planning," (2) "occupational information," (3) "mathematics and science involving . . . technical problems," (4) content more directly related "to modern industrial developments and the basic problems of industry." Examples of this include "mass production, improvement of product design, research and development, new machines and processes, uses for new materials, labor utilization, management, automation, safety, and communication."

A procedure for this re-emphasis is suggested: "A first step for industrial arts curriculum planners could be to identify these main problems of industry appropriate for study at the different grade levels. Second, select guidelines that aid in determining the most significant problems. Third, after a specific problem is identified, teaching units could be prepared to bring about a desired learning situation with the focal point of the unit directed to the problem."

Finally: "It is entirely possible, in fact probable, that new courses may emerge around significant problems of industry rather than around traditional industry materials, such as, wood and metal. Evidence seems to point in this direction with course titles of transportation laboratory, graphic arts, and rudiments of technology. Others might be industrial research and development, principles of production, industrial technology, communications, new materials and new processes, etc." □

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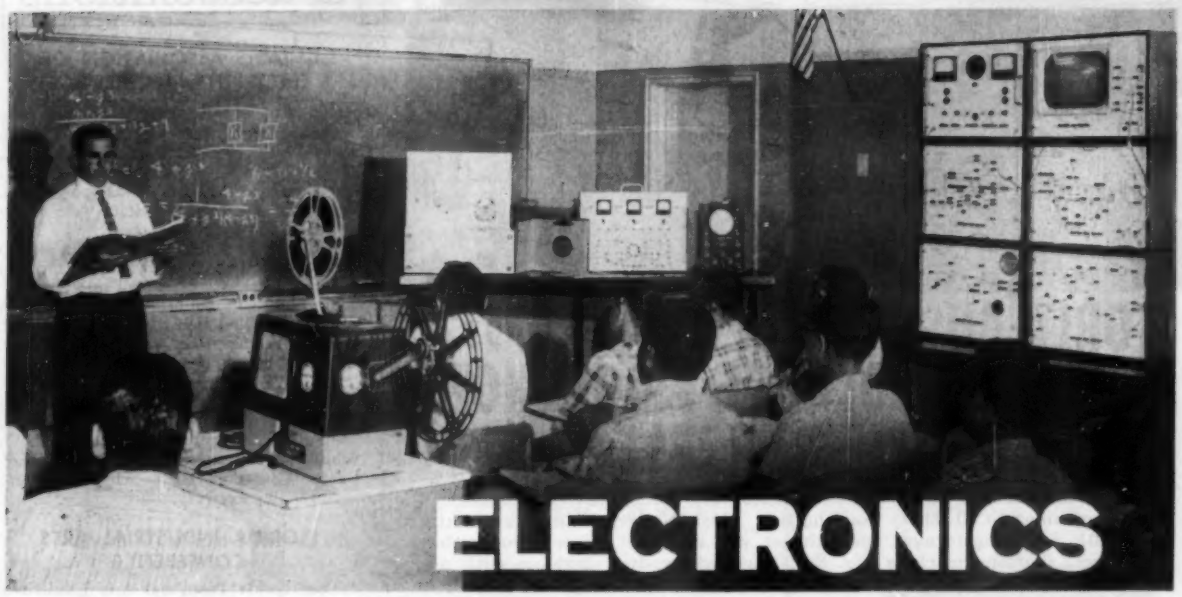

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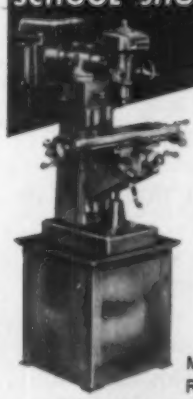

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ILLINOIS ASSOCIATION OF ELECTRICITY-ELECTRONICS EDUCATORS

At a meeting held at Arlington High School, Arlington Heights, Ill., on May 13, 1961, the Illinois Association of Electricity-Electronics Educators was organized. Twelve schools from the state were represented at the meeting.

The constitution committee has set up the constitution which was presented to the membership at its fall meeting.

Meetings will be held twice a year in addition to the annual business meeting. Future meeting dates will be announced, and information concerning the organization can be obtained from the officers.

Officers for the association are: John W. Griffith, president; Floyd Corl and John A. Striepling, vice-presidents; T. W. Whitfield, treasurer; and Dave Baker, Lyons Township High School, Western Springs, Ill., secretary.

FLORIDA INDUSTRIAL ARTS CONFERENCE

The Florida Industrial Arts Conference was held on Friday and Saturday, October 20 and 21, 1961, at the Soreno Hotel, St. Petersburg, Fla.

Program highlights included a talk by Dr. Marshall L. Schmitt, industrial arts specialist with the U. S. Office of Education, Washington, D. C. His topic was "Industrial Arts — Its Future Is up to You." Ralph V. Steeb presided at this meeting.

A. F. Persons, manager, X-Ray Division, General Electric Company, St. Petersburg, addressed the luncheon meeting on Saturday, at which Stanley Sweet, supervisor of industrial arts, Pinellas County, Clearwater, presided.

VIRGINIA INDUSTRIAL ARTS ASSOCIATION

The Virginia Industrial Arts Association will conduct a two-day annual convention program on November 3 and 4, at Richmond.

Dr. William J. Micheels, president, Stout State College, Menomonie, Wis., and president of the American Industrial Arts Association, will be guest speaker, and will use as his theme "The Challenge to Industrial Arts."

Officers of the Virginia Industrial Arts Association are Joseph A. Schad, president; Ralph Lewis, first vice-president; Frank West, second vice-president; and Virgil Harris, secretary-treasurer. Yearbook editor is Walter L. Griggs.

COMING CONVENTIONS

Nov. 3–4. Kentucky Industrial Education Association, at Kentucky Hotel, Louisville, Ky. Exhibit chairman: Paul E. Harris, 506 W. Hill St., Louisville, Ky.

Nov. 10–11. Oregon Industrial Arts Association, at High School, Medford, Ore. Exhibit chairman: Vern Voss, High School, Medford, Ore.

Dec. 3–5. American Technical Education Association, at Hotel Muehleback, Kansas City, Mo. Secretary: William N. Fenninger, 22 Oakwood Place, Delmar, N. Y.

Dec. 4–8. American Vocational Association, Inc., at Municipal Auditorium, Kansas City, Mo. Exhibit chairman: Lowell Burkett, 1010 Vermont St., N.W., Washington 5, D. C.

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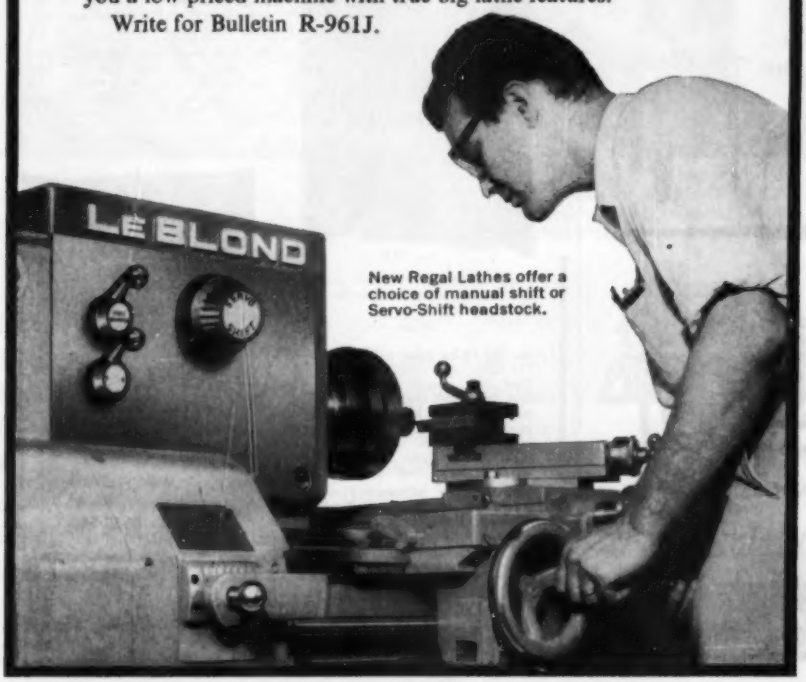

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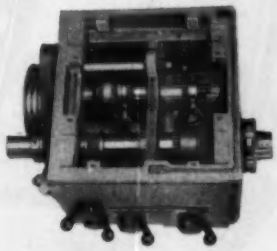

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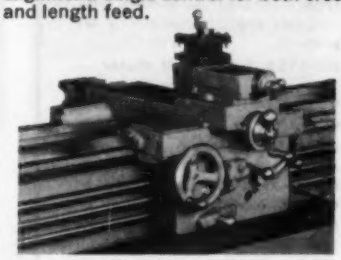

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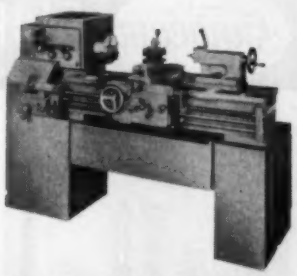

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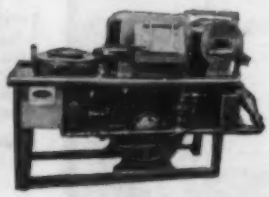

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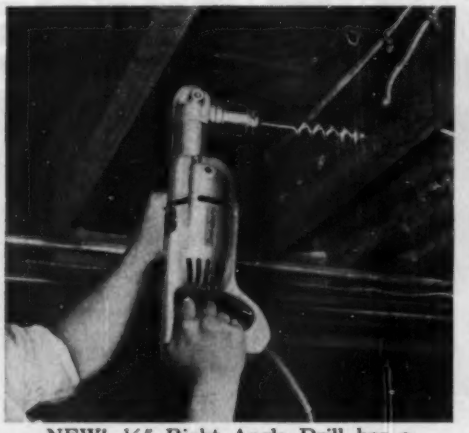

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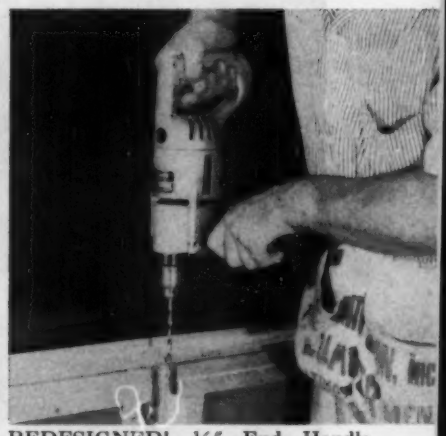

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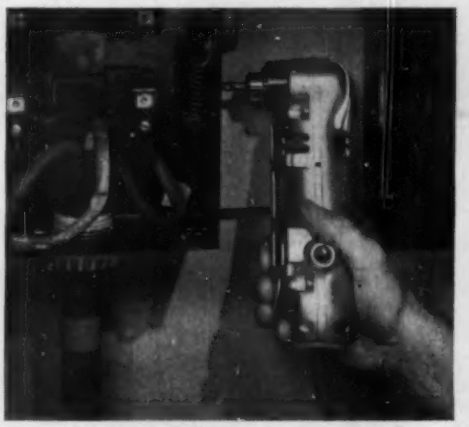

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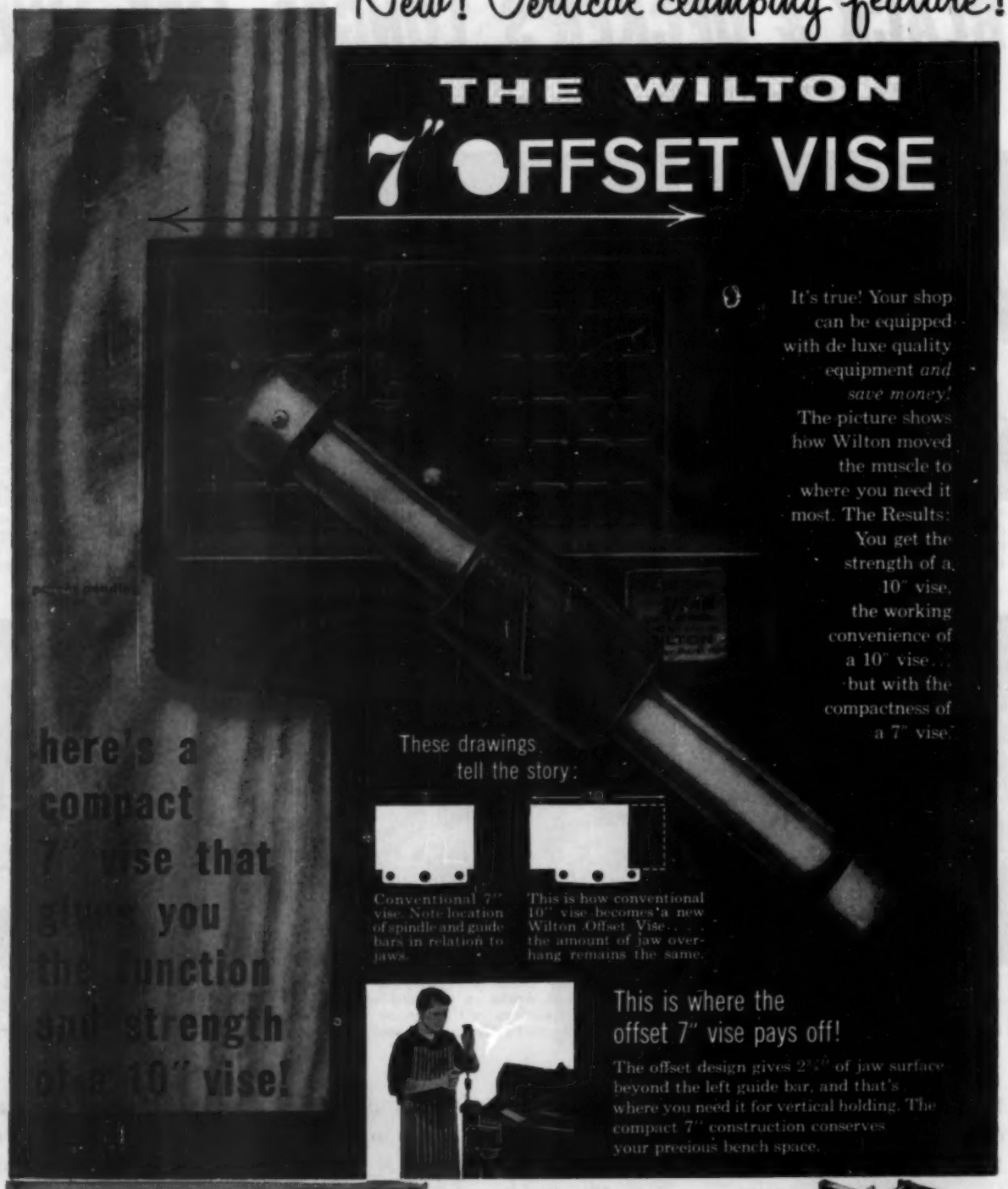

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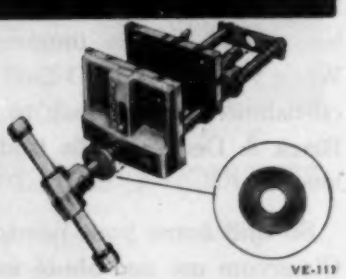

VE-111

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A NATIONAL CURRICULUM FOR INDUSTRIAL ARTS?

Within the past week there arrived on your editor's desk a new U. S. Office of Education bulletin titled, "Industrial Arts — An Analysis of 39 State Curriculum Guides." These were guides published between 1953 and 1958 representing a total of 22 states which have published during that period some kind of curriculum material intended to help schools and instructors in establishing industrial arts programs. This excellent bulletin was the result of a study made by Dr. Marshall Schmitt, OE specialist for industrial arts, and several researchers.

In preparing the study, the researchers analyzed all of the curriculum guide materials and set up tables showing the instructional topics that were suggested in these 39 guides. They found a wealth of material for drawing and planning, woodworking, metalworking, electricity and radio and a more limited amount in plastics, graphic arts, and transportation and power mechanics. An attempt was made to analyze each instructional topic under these areas and to indicate how many states and how many guides reported this content for either junior or senior high school level. (This, of course, turned out to be a long and tedious job.)

It was found that, in general, the guides followed the analysis technique and indicated the operational units and the informational units that might be covered. Interestingly enough, however, most units were concerned with the use of hand tools or the operation of machines and related information concerning materials. The researchers found that there was not very much agreement as to what should be taught. Each state apparently has its own ideas as to what is good industrial arts. The only exception to this was found in cases when the state curriculum guide generally followed the bulletin published by the AVA titled, "Improving Instruction in Industrial Arts."

Insights Into Problems

Some interesting insights into our problems can be obtained from this analysis. First of all, it seems rather significant that less than half of our states (only 22) published any kind of curriculum guide between 1953 and 1958. Second, among the states which did publish such materials, there is not great uniformity as to suggested teaching content. Third, the curriculum guide indicates that we have not progressed in our thinking very far away from the concept of teaching basic hand tool and machine processes in the making of a project.

Very little evidence was found to support the frequently stated objective that industrial arts interprets American industry. As a matter of fact, the researchers devoted the last chapter of their report to pointing out that industrial arts is not very effective in helping students understand our industrial economy and that perhaps there should be some drastic changes in the organization of our curriculum material. They suggest that our curriculum guides should perhaps be based not on an analysis of tools and machines as they relate to processing a particular kind of material, but rather, that they be organized around modern industrial developments and basic problems of industry. In other words, instead of metalwork and woodwork, perhaps we should have industrial technology and communications.

(For a detailed review of the booklet, "Industrial Arts — An Analysis of 39 State Curriculum Guides," see pg. 8 of this issue of your IA/VE.)

This brings us to a point we have stressed in previous editorials: **If industrial arts is part of general education and is good for all, then why shouldn't we have a national curriculum for industrial arts?** How can we expect to identify industrial arts as a curriculum area if every state and every teacher teaches different material? There are those, of course, who suggest that industrial arts is only a teaching method and not a content area. We assume this group is in the minority. If the major portion of teachers in the United States agrees that industrial arts is an essential subject in our curriculum, then it's time we set up, not state curriculum committees, but a national committee to identify in clear terms what should be covered in each area of our program.

Re-evaluate Our Present Curriculum

However, it is our contention that industrial arts is in no position to move directly from an organizational pattern around materials such as woodworking and metalworking to one around such major problems of industry as industrial technology and industrial research. We favor re-evaluation of our present curriculum area with an attempt to modernize and standardize content at the junior and senior high school level. We favor some good research and experimentation along the lines suggested in the last pages of the bulletin. In other words, some schools should make an attempt to organize courses around such major areas as principles of production, industrial technology, and industrial research. If it can be shown that this is a superior organizational pattern and that the average industrial arts teacher could handle it, then it should be given serious consideration.

What we need more than anything else at the present time is a modernization of our present courses. There is much that can be done to improve our courses in woodworking without completely changing them. There is little evidence in the instructional topics listed under woodworking, for example, that much is being done to teach students about the new man-made materials, about modern building techniques, and about production of wood products. These could all be integrated into one of the present woodworking courses. Much about industrial technology could be taught in our present metalworking programs. Certainly the importance of jigs, fixtures, and dies, interchangeability of parts, precision measurement, and so forth, could be covered. There is an urgent need to revitalize and standardize industrial arts courses.

Let us remind our readers again that we do not refer to standardization of projects or students' activities. Our only interest is in having some uniformity of course offerings and content throughout the United States. If we are not willing to establish this uniformity, we will be the ones to suffer in the end. □

John L. Feirer

round table

Should The Objectives of Industrial Arts Change?

□□□ *This is the initial article in a series designed to analyze several of the more vital questions confronting modern industrial arts.*

The questions will be commented upon briefly by some of the leaders in industrial arts who have a special interest in the area.

As a final step in this "round table discussion," we hope you will write your own views on the topic. (Send them to the Editor at 400 N. Broadway, Milwaukee 1, Wis.) As many of these views as possible will be published in the "letters to the editor" column in forthcoming months' issues.

at the round table

Baily

Jarvis

Maddox

Pendered

"We should restudy our objectives and bring them up to date."

One of the earliest lists of industrial arts objectives appears in *The Standards of Attainment of Industrial Arts Teaching*, published by the American Vocational Association in 1934. These objectives were an outgrowth of an interest in industrial arts in the American Vocational Association Meeting in Los Angeles in December, 1927. As a result of this interest and meeting, in 1928 a committee on Standards of Industrial Arts Teaching was appointed by the president of the AVA. However, it was not until 1934 that the publication of *The Standards of Attainment of Industrial Arts* reached the final stage. This list of objectives has remained approximately the same, with the addition of one objective, Health and Safety, which was added when the publication was brought up to date and entitled "Improving Instruction in Industrial Arts," in 1948.

The third revision of the publication in 1953, called "A Guide to Improving the Instruction in Industrial Arts" carried the same objectives as the 1948 issue. This sketchy background indicates that we have been using for the past 30 years an original set of objectives with very minor changes. If our society and industry had stayed static during the past thirty years, these objectives might still be as effective as they were originally, but with the major changes that have taken place in industry, science, and our society and technology, it would seem that the objectives of industrial arts should be reviewed carefully by competent people to re-evaluate and change by addition, alteration, and deletion those which do not fit our present pattern. As an example: at one time emphasis was placed on industrial arts as a means of interpreting industry. At the time it was stated, that might have been a realistic objective. There has developed, however, a great chasm between what is going on in industry and what is going on in the industrial arts laboratory. It is doubtful if we are in any way approachthis objective. We should restudy our objectives and bring them up to date, the same as we should study curriculum guides and subject-matter content. □

ATHOL R. BAILY
Assistant Professor of Industrial Education
University of Washington, Seattle

"For some students . . . general education; for others . . . prevocational in nature."

Definition: Industrial arts courses are those shop and drawing classes which are scheduled for grades 7–12 and which are not reimbursed under the federal acts.

The prime purpose or objective of industrial arts courses, according to the definition officially adopted by the American Industrial Arts Association,[1] is as follows: To define, stimulate, coordinate and strive for the ideal form of industrial arts education as a vital aspect of general education on all levels, elementary, secondary, and adult, nationally and internationally.

This statement is, I presume, an outgrowth of many convention programs, conferences, and group discussions. I believe, too, that it is a statement which reflects the thinking of many supervisors, consultants, teachers, and teacher educators now active in industrial education.

But should the preceding objective be the only purpose of industrial arts? I think not.

And, also, what does the taxpayer think of industrial arts? Does he believe it to be an important activity in the total school program?

In a recent article, "Voters and Their Schools,"[2] 4925 persons replied to a series of questions, one of which — together with its answer — was stated thusly:

Q: What does the voter consider the least important tasks of the school?

A: To teach about the local region, to afford enjoyment of cultural activities such as art and music, *and to provide industrial arts.* (italics mine)

From that same article has been excerpted a second question, also with its answer:

Q: What does he (the voter) think the schools are doing poorly?

A: Teaching about budgeting and the use of money and property, giving pupils a knowledge of occupational opportunities, providing psychological guidance, and *providing vocational education for industry.* (italics mine)

It would seem, therefore, that the taxpayer rejects the concept that industrial arts is general education only and, instead, asks that our shop and drawing classes make an effort to provide students with some degree of vocational training.

A number of schools, it is true, already recognize the fact that the industrial arts program should offer some measure of vocational education. For instance, in the public schools of Milwaukee, Wisconsin, the industrial arts program does provide students with marketable skills and experiences which form a basis for occupational employment.[3] In Wichita, Kansas, industrial arts and crafts programs have equipped students, by the time of their graduation, with a head start toward qualifying for apprenticeship in skilled jobs.[4]

Conant,[5] discussing educational objectives in a widely-read magazine, pointed out the value of shop and drafting courses: ". . . some portion of the school day in the eleventh and twelfth grades should be devoted to practical courses . . . for boys vocational courses such as auto-mechanics or machine shop work."

High school principals are also aware of still another purpose of industrial arts courses. For instance, the following sentence was part of a letter recently sent me by a high school principal: "I hope to include a semester of drawing for pre-college students, that work to be directed especially to future college students in mathematics, science, and engineering."

Thus, I believe that for some students industrial arts courses should be general education; for others, such classes must be vocational or prevocational in nature; and for still others, this course content has college preparatory value. □

[1]American Industrial Arts Association, Inc., Resolution of Members Authorizing Amendments to Articles of Incorporation.

[2]NEA Journal, March, 1961, p. 29.

[3]Delta Power Tool Instruction, Fall, 1960, p. 4.

[4]Delta Power Tool Instruction, Winter, 1960–61, p. 6.

[5]*Ladies Home Journal*, May, 1960, p. 30.

JOHN A. JARVIS
Dean, School of Industrial Education
Stout State College, Menomonie, Wis.

"The real problem seems to be one of implementation of the purposes of industrial arts."

"Educational objectives serve three purposes:[1] (1) as goals to be attained; (2) as guides in the selection of content, organization and procedure; and (3) as standards in evaluation of attainment. They are determined by a careful consideration of (1) the nature and needs of society past, present, and future, (2) the character and needs of the individuals to be educated and the best there is in educational theory and practice." The purposes of industrial arts education are to develop: (1) skills in the production and use of sketches, schematics, graphs, diagrams, and drawings; (2) skills and knowledge in the use of tools, materials, products, and processes of industry; (3) discriminating consumers of goods and services; (4) wise and purposeful use of leisure time; and (5) an understanding of the world of work and abilities of young people to make occupational choices in terms of their interests, aptitudes, and capacities.

[1]London, H. H., *Course of Study*, Unit II, Principles of Trade and Industrial Teaching.

These objectives of industrial arts are generally accepted and educationally sound. Much time and effort have been spent by distinguished leaders of industrial education in formulating the purposes of industrial arts. These purposes have stood the test of time and change. Educators and educational philosophers have no quarrel concerning the value and soundness of industrial arts objectives.

The real problem seems to be one of implementation of the purposes of industrial arts. Possibly a reason for the lack of proper implementation is the failure of educators to continuously evaluate the total program of industrial arts and the results of teaching in terms of the accepted objectives.

Industrial educators need to make an analysis of present industrial practices and install those activities which are adaptable to school shop conditions. Teachers in the area of industrial arts have been criticized, probably justly, for permitting students to work too slowly and leisurely. Not enough emphasis has been put on speed with accuracy. The use of some production work with set standards and time limits might alleviate this criticism. Special emphasis on meaning of interchangeability of parts and the integration of scientific and mathematical principles with industrial practices would help achieve the purposes of industrial arts.

If educators expect to accomplish the goals which have been established for industrial arts, they will have to dismiss the idea that it can be done with inadequate finances. Employment of good teachers means competition with industry for their services. If students are going to learn about industry, they must have tools, facilities, and materials with which to learn. Administrators need to obtain the best teachers available who in turn have the responsibility of analysis of industrial activities, writing courses of study, planning the industrial arts program, presenting clearly the facilities needed to accomplish the aims, apply the best educational theories and practices in using the facilities furnished, and evaluate the results of teaching in terms of the accepted objectives.

The present objectives of industrial arts are entirely adequate. Changes should be made in content and methods

of industrial arts to be in keeping with sociological and economic conditions, and new materials and processes of industry. □

MARION E. MADDOX
Professor of Industrial Education
University of Arkansas, Fayetteville

"We need first to agree upon a series of realistic objectives and to decide upon their relative importance."

Before considering any changes in the objectives for industrial arts, one may well ask: what are the objectives for industrial arts? It seems logical to study our present goals before seeeking changes. Immediately this leads us into a dilemma for there is no standard set of objectives for industrial arts which is recognized by all in our field. As a whole, industrial arts teachers probably are more in agreement than in disagreement about our educational goals. but it is unfortunate that we are not in complete harmony.

Because we have no universally-accepted goals for our area of the curriculum, we must turn to statements of objectives by committees, professional organizations, and prominent personalities in the field. This leads to another interesting question: whose objectives shall we consider for change? The number of objectives claimed for industrial arts varies with the author. Within the past 15 years lists have appeared containing from 4 to 37 objectives for industrial arts. It certainly would make a difference whose objectives we chose to revise.

Should the objectives for industrial arts change? Yes, definitely, yes! In the first place we have too many objectives. We should focus our attention and efforts upon fewer goals. We should use a rifle approach rather than a shotgun approach. At the present time there are so many objectives that a teacher can do almost anything in the name of industrial arts and still justify his actions completely. For this reason industrial arts activities presently range from the sublime to the near-ridiculous —all properly justifiable, however, under one or more of our present objectives.

Then, there is the problem of emphasis which each objective should receive. Few writers are bold enough to

(Concluded on page 54)

Automation and Industrial Arts

O. S. HARRISON

□□□ ***What does automation mean for industrial arts instruction? A discussion of how instructors can orient I-A students to this phase of technology through a class project.***

Automation is a new word; to many people it has become a scare word. Yet it is not essentially different from the process of improving methods of production which have been going on throughout the history of mankind. Automation has been with us ever since some person by superior intellect or by pure luck first used stone or wood to do better and faster some of the things done only by hand.

We all have vague ideas of the impact on employment with the development of the electric eye, mechanical brains, and other intricate electronic and radiative devices which operate and control various types of machines. The production engineer has at his disposal a wide variety of machines and devices for controlling them which, when put together in proper sequence, can turn out a continuous flow of mass-produced articles without human hands touching them during the entire manufacturing process.[1]

[1] Maher, Edward, *Automation, A Background Memorandum*, National Association of Manufacturers, New York, N. Y., 1960.

Implications for Industrial Arts

Now what does all of this have to do with industrial arts? Is it any concern of ours since automation, in some degree, has always been with us and will continue to be — and in all probability will be accelerated?

If we subscribe to the philosophy that one of the prime purposes of industrial arts is "To develop in each student an insight and understanding of industry and its place in our culture,"[2] then it is perhaps not only within our area of subject matter but our definite responsibility.

Pupils do not understand the ambigu-

[2] Schmitt, Marshall L., Conference on Industrial Arts, Office of Education, Washington, D. C., 1960.

Dr. Harrison is chairman of the industrial arts department, University of Georgia at Athens.

ous terminology, the shop-worn phrases, and the high-sounding utterances educators are likely to use in working with youth. Helping the individual find his place in society; we are not concerned with teaching subject matter, but we are concerned with teaching the boy; the worth of the individual is important; we must all work toward helping the pupil attain his highest level of potentiality; these have little meaning. Many of us use similar statements because we are not able to really do creative thinking and work in arriving at solutions which will help pupils solve their problems. As we all know it is easier to talk than to do.

Pupils are concerned with such things as: If I prepare for a particular type of work or profession will there be employment for me when I finish my preparation? What industries or professions will be either declining or extended within a few years? If a pupil asks such a question, it is possible (and quite likely) the teacher will tell him to study the problem and report back to the class what he learned and present to the class the benefits of his opinions. And that will usually stop the bright pupils from asking questions not directly related to the course.

It would be folly to contend that automation will not bring about major changes in our economy and way of life. If it did not, there would be no purpose at all in the work of the scientists who are developing this technological concept and the production engineers who are conceiving ways in which to put it to work.

A Class Project

We should let the pupils learn — and this may be done through leadership on the part of the teacher working with the pupils in making a careful study and evaluation of the material on the problem of automation — that there will be manufacturing industries in which total employment will be increased through automation, there will be others in which it will be reduced, and still others in which employment will have vanished. A close study will reveal there will be some industries not now in existence, which will offer many opportunities for employment.

Everyone should realize that changes are made when a new industry begins and then develops on a national scale. When this happens, it may or may not replace another industry. Many examples could be cited, but one will suffice. For a long time draymen with horses and wagons worried about what would become of them when hauling would be taken over by trucks. Most of the draymen later become truck or taxi drivers and many more jobs were made available.

New industries do not always replace old industries. Many times they replace a poor condition, such as electric lights replaced semi-dark homes with well-lighted homes. Our heating devices with excellent fuels such as oil, gas, and electricity have, to a large extent, replaced the heating of our homes with stove wood which had to be cut by hard labor.

After classroom study and discussion on automation and its impact on our lives, the industrial arts teacher should mention that the qualified person, in terms of education and ambition, can always adjust himself to changing conditions. The person with study and desire always has and always will make successful adjustments. The pupils with the better chance of coping with any situation are those who remain in school and complete, at least, a strong basic education.

Sources of Data

There are many places to gather data[2] and projected studies on automation and employment. Perhaps the following will give some new light on the outlook for the chances of youth finding a successful place in society.

Between 1960 and 1970 total employment will increase by 20 per cent. Construction, finance, real estate, insurance, trade, and government services will increase at a faster rate. Manufacturing employment will increase at about the 20 per cent rate, while transportation, public utilities, and mining will increase at a much slower rate. Agriculture will not be good as it will experience a decline.

Professional and technical personnel will increase by 40 per cent during the next ten years, while proprietors, managers, and skilled workmen will increase about the 20 per cent rate. Clerical, sales, and semi-skilled workers will increase by about 25 per cent. Employment for the unskilled in all classifications will show a decline.

Equally important is the age composition of the 1970 labor force. Workers under 25 years will increase by 46 per cent. The 25–34 age group will account for only a 12 per cent increase. Most distressing is the fact that there will be a decline in the number of workers between the ages of 35 and 44. The over 45 age group will experience a 20 per cent increase.

The introduction of technological improvements will place an obligation on the labor force and schools. At the same time it will help solve some of the problems associated with the efficient utilization of manpower.

During the next ten years life in America will be richer, better, more rewarding, with greater opportunities for the young, increased satisfaction for adults, and more tranquility and comfort for all. This is certainly true for those who prepare themselves to meet the challenge. □

[2] Manpower — Challenge of the 1960's. Bureau of Labor Statistics. U. S. Dept. of Labor, Washington, D. C., 1960.

— Chrysler Corp.

One phase of automated power plant processing at Chrysler: verification of the fact that "The introduction of technological improvements will place an obligation on the labor force and schools."

Training for Industry

RAY HARDY

□□□ A report of one industrial program designed to keep employees current with method and process development.

The search for trained personnel in all phases of industry is as continuous as it is logical. Rising cost and competition are constant demanders of improved operations. While corporate growth alone justifies training, the need is compounded by the advanced trend of the times, coupled with the individual's never-ending search for expanded knowledge and income.

With the continuous increasing of competition in the aircraft industry, it is essential that the estimator, the buyer, the administrator, the design engineer, and other affiliated personnel be well versed in the science of manufacturing methods and processes.

The Problem

Current approaches are not parallel with the sophisticated materials such as beryllium, zirconium, titanium, inconel, and monel which are being introduced. In order to work these new materials there has been an increase in the development of methods and facilities. Some of these methods are chemical milling, spark erosion, and electrical discharge. The high speed tool bit which the machinist could sharpen and have on hand has been replaced with ceramics and synthetic diamonds developed through the tool engineers' never-ending search to find harder materials to machine harder metals. With this, the abrasive manufacturer had to formularize abrasives and design wheels to sharpen these peculiar tools, coupled with the design of facilities to control every geometrical point of the tool for maximum life and productivity.

Knowledge of manufacturing methods is a valuable assist to the buyer in selecting a properly equipped vendor. One of the most important factors in the aircraft industry is schedule. If a vendor must subcontract operations which he is not equipped to perform, the lead time is increased — and so is the middle man profit.

Because of mentioned competition, the estimator must be prepared to base his quotations on the most productive and economical methods and processes possible. He must consider the rates of the facilities involved and be capable of measuring the time element. For example, in machine shop, the rate on a No. 6 hydrotel profile mill will be much higher than the rate on a No. 6 conventional mill, even though the capacity of the two machines is the same.

To parallel machine shop, in sheet-metal fabrication the rate of a hydroform operation would be much more than that of a punch-press operation because of the difference in the capital cost of the two machines. The reason that the hydro-press operation overrules the punch-press operation is the tooling cost involved. A simple form block is made to produce a formed hydro-press part where a complex form die with die sets must be made to produce a punch-press-formed part.

How Training Programs Serve

The training section can use this information to introduce manufacturing methods to unattached personnel and to familiarize apprentice machinists and associated personnel with the basic terminology, machines, attachments, accessories, required tools, and operational methods.

The employment office can use this information to screen and help select applicants for possible affiliated positions, such as tool and operation planners, machine tool designers, machinists and machine operators, or applicants claiming diversified experience who seek employment as tool engineers or related positions.

Additional knowledge of manufacturing methods will enable the design engineer to consider the complexity of his design measured against methods of fabrication. For example, he may design a component to be manufactured by profiling. With knowledge of this operation, he will provide generous inside radii, knowing that this controls the diameter of the cutting tool and the greater the diameter, the more accurate the cut and the more productive the operation because speeds and feeds can be accelerated.

An Industrial Training Program

Through their industrial training section, the material department of Convair (San Diego) Division of General Dynamics Corporation, is attacking one phase of this problem with a recently inaugurated program covering materials and the science of manufacturing methods and processes.

Two classes have been graduated to date, and because of the popularity of the program, enrollment for the fall semester had to be closed with 150 registered students. All classes are conducted on Convair premises, after working hours. The program is under the auspices of the San Diego Junior College, which makes it an accredited course.

Convair has opened its doors for the program and has students from nearby aircraft plants in attendance.

The complete program consists of 38 sessions with each session three hours long. It is designed for two semesters.

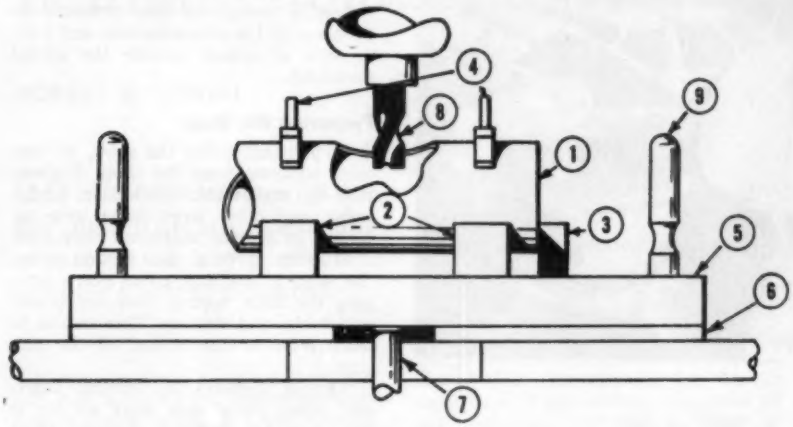
The title of the program is "Manufacturing Methods and Processes." The text, prepared by the writer who holds an aircraft inspection teaching credential, consists of over 40,000 words covering 100 subjects. It has been correlated with 1000 opaque slides selected from photographs provided by industry, as well as pictures from trade magazines and industrial brochures.

Co-operation From Industry

Ninety-five industrial concerns, both big and small, all over the country, provide filmed material on a loan basis and brochures for class distribution.

The co-operation received from industry is beyond wildest expectations. Many have sent representatives over 1000 miles to deliver a lecture. They

Mr. Hardy is assistant supervisor of materials handling, Convair Division of General Dynamics Corporation, San Diego, Calif.



Pin-routing operations are most commonly employed in the manufacture of sheet-metal details having irregular cutout points or edges not lending themselves to conventional methods, such as radial arm routing and piercing.

The illustrated example above is typical of pin-routing applications. In this example the task is to provide a hole through one wall only of a tubular part. This is accomplished by using a pin-routing fixture. The tube (1) is nested in V blocks (2) and located against a stop (3). Contour straps and toggle clamps (4) are provided to hold the part in position.

To the base of the pin-routing fixture (5) is attached a subbase (6) in which a hole is machined. This hole meets the cutout specifications of the hole to be made in the part. The action of the operation is to locate the pin (stylus) (7), which is in direct line with the router bit (8), in the hole in the subbase (6). Note shaded area. The bit (8) is then lowered into the work (1).

By grasping the opposing handles (9), the pin-routing fixture is moved to points controlled by the stylus within the confines of the hole in the subbase. With this action the router bit (8) is removing material from one wall of the tube (1), accomplishing the task.

A typical example of the illustrational material in Convair's "Manufacturing Methods Manual" which describes and shows how the operation of "pin routing" is applied in manufacturing.

have forwarded sample kits, display panels, complete lectures with film strip or slides which represent their products. Machine tool manufacturers have donated scale models of their facilities which reveal the features and versatility for which they are noted.

Enough emphasis cannot be placed on industrial co-operation. It has been the writer's experience in corresponding with industry (some of which are normally competitive), that in training they are "one big family," freely donating "know how," time, and materials for the betterment of education. In summarizing industrial co-operation, the brochures they have furnished for class distribution in the fall semester total approximately 6500 with an estimated publication cost of $2,500 — not to mention their educational value.

Fabric of the Course

Initiative for the students to attend is generated by showing a general interest short film at the start of each session. For example, we have scheduled and received confirmation on such films as the "USAF Thunderbirds," "The Northrop Snark," also North American's "This Is Air Power" and "Special Showing of Latest Aircraft." Others are the Bendix Productions' "Air Power '56" and "Into the Yonder With Guided Missiles." The I.A.S. (Institute of the Aeronautical Sciences) library has supplied many such films.

During each session one or more of 88 manufacturing films used throughout the 114 hour program are shown. These films are produced by industry to demonstrate the facilities and/or products which they manufacture. These films are scheduled so they relate directly to the topic of discussion. It has also been experienced by the writer that no difficulty is encountered if a three-month lead time is allowed for reservation of filmed material.

The scope of this program starts with the mining, refining, and forming the materials now used and those that will be used in the very near future by the aircraft and missile manufacturer into stock shapes. The principal characteristics, applications, machinability and formability are also explained.

The methods and processes selected are most common to the aircraft industry. They differ considerably from techniques used in the automotive or comparable industries, as aircraft production requirements seldom justify the progressive tooling and automation employed for high-production manufacturing.

Throughout the methods and processes sessions, material prepared by the writer is passed out to the class. Examples of this material are shown in accompanying illustrations. An index and binder are furnished each student with the accumulation of the subject material; at the end of the program each student is provided with an 150-page Manufacturing Methods Manual.

Course outlines are distributed to each enrollee. The outline reveals the subject matter, date each subject will be discussed, and a session number for quick reference and filing purposes.

Serving a Need

With existing conditions, in the event of a national emergency, versatility through diversified knowledge cannot be utilized. The shifting of personnel from one task to another because of selective service or some other governmental requirement would result in a production obstacle. This was one of our principal problems at the outbreak of World War II.

In a program of this type, introduced as regular school curriculum, young men and women presumably interested in the science of manufacturing would have an opportunity to accept or reject it as an occupation. In any event, they would be basically prepared for employment in thousands of industrial concerns across the country.

This missile and rocket age demands more "know-how" in the science of manufacturing to meet the demands of fabricating the new peculiar materials and structures necessary to move thousands of pounds at hypersonic speeds.

As previously mentioned, current manufacturing methods are not parallel with the materials and structures being introduced.

The tool engineer must work hand in hand with the metallurgist for the peace and prosperity of our country. □

New cars! How this bonus attraction for "back to school night," is building up the reputation of the I-E program and serving instructional purposes of the students.

Back-to-School Night in the Auto Shop

CARROLL S. HAYES

□□□ *During "back to school night" an added attraction on new car displays represents effective public relations.*

Parents will be drawn to the auto shop during "Back to School Night"—if there is some attraction. A car show seems to work very well. People like to view a variety of cars without having a salesman trying to make a sale. This is the second year that the author had the opportunity to present the show. The results have been very good both times.

Student Participation

The students in advanced auto mechanics were the ones that contributed primarily to the show. About a month prior to the back-to-school night program, the suggestion was made that we have a compact car show in the auto shop. An assignment was given to write a research paper on any new car or new car feature. In addition, the students were all to give an oral presentation of their findings to the rest of the class.

Students were given the opportunity to vote for six cars that they had found to be the most interesting. It was these cars that we would try to obtain for our show.

New car dealers selling these models were contacted and asked if they would be willing to loan us a car for display purposes. In almost every case, dealers are more than happy to be able to have their cars displayed. In most cases, dealers will deliver and pick up their own cars. A few will ask to have them picked up and returned. (Students are always anxious to take care of this.)

Announcing the Show

To be a success, any show must be publicized to create an interest in it. An announcement was run in the daily school bulletin for two days prior to the show asking students to tell their parents to visit the auto shop during back-to-school night to see the display of compact cars.

In addition, the local newspaper was asked to publish an article telling of the show. Its publicity of the event included related information about the back-to-school night program. (Needless to say, the high school principal should be consulted on this matter when obtaining permission to have the show.)

Radio and television stations are another good source of publicizing an event of this sort, and will do so as a public service at no cost.

Special invitations were extended to members of the administration and staff, as well as others outside the school personnel.

Mr. Hayes is an instructor of auto mechanics at Catalina High School at Tucson, Ariz.

Preparing the Shop

In preparation for the show, all cars were removed from the shop. Engines, tune-up equipment, lubrication equipment, and other large items were arranged to provide maximum floor area.

Students spent a class period giving the shop a thorough going over: mopping the floor, wiping down equipment and tools, and dusting. This should be done prior to the arrival of the new cars.

Various displays of training charts and other visual aids were set up in the shop for parental viewing. These add a lot of color and stimulate interest.

The Turnout

The number of parents and students visiting the auto shop was very gratifying—especially in comparison to the number visiting other rooms and shops. Although no one officially took a count, several hundred adults and a hundred students were estimated to have attended.

Advanced auto mechanics students, previously elected by members of the class, were present to explain to parents any of the cars on display as well as to explain the new car features. Students were also expected to answer parents' questions concerning their course in auto mechanics.

Many fine compliments were received regarding the show. Also, it afforded an opportunity to visit with many parents—visits which probably would not have been possible, if it were not for the show.

Follow-Up

A telephone call expressing appreciation and a written letter of thanks should be sent to all the car dealers which contributed to the show. Cars will more than likely be available again if needed for another show in the future if this is done.

A report was made to members of the class who had not been able to attend the show.

Many opportunities for public relations are opened in having a show such as this. Administrators, other teachers, car dealers, newspapers, parents, and the public in general were contacted. Students, too, are broadened by their experiences in writing and giving oral presentations in class, and meeting the public.

Students are already asking when we're going to have the next show. Foreign cars, sports cars, custom cars. □

Human Relations: Key to I-E Success

ROBERT B. LYNCH

□□□ Co-operation with fellow industrial arts instructors can result in more effective teaching-learning situations.

Human relations, as old as man himself, is a factor we still sometimes overlook in trying to improve our teaching techniques. A plant personnel director told that 85 per cent of employment involves getting along with other people and that, perhaps, 15 per cent of a job requires technical "know-how." Many ministers also have spoken on the fact that we, as humans, are capable of destroying one another with scientific inventions, yet incapable of living together.

As we constantly move along in our world of technological advances, we must also strive to keep abreast of advances in human relations as a means of improving our industrial arts programs. The fourth objective in the AVA bulletin, "A Guide To Improving Instruction In Industrial Arts," states: "Cooperative Attitudes. To develop in each pupil a readiness to assist others and to join happily in group undertakings." As industrial arts teachers, suppose we look at this objective for just a moment.

Exchange Teaching

Last year I suggested to my shop "neighbor," who teaches a different subject, that we put a large door in the center of the connecting wall so at times our students might have the advantage of two shops. (He had some modern welding equipment that I wished to use under a unit in my advanced industrial arts class.) He questioned whether this arrangement would work since our courses differed.

He suggested, however, many times before, that he wished his students could be taught elementary mechanical drawing; unfortunately, he had not had this course in college. One can readily understand that it did not take a national arbitrator or diplomat to solve this problem. I immediately volunteered to teach his students a week of mechanical drawing if he would give my students a week of welding experiences. Just plain human relations.

Mr. Lynch is an instructor of industrial arts at St. John's High School, Darlington, S. C.

Teaching Co-operation

About three or four years ago I was struggling along in a unit in ceramics with my students and was having trouble getting it to "go over." There was just so much that I didn't know about the subject. One day the art teacher came in and immediately saw some of my problems. (He had a minor in ceramics.) He started to coach me and help some of my students. Suddenly ceramics caught fire and began to blaze. Two students became inspired and worked every evening and even on Saturdays. They built an outdoor kiln just to experiment with the effect of wood on glazes. They visited brick yards to investigate temperature and body in clay. As a result of their efforts they placed first and second in the state industrial arts contest. They also placed first and second in the Clemson College regional Art Exhibit contest. One student received honorable mention in the Ford Industrial Arts Contest with a project which had been broken in shippage. The students put on an open house exhibit to display their ware. Immediately, the public wanted a civic education class in ceramics and 52 adults signed up the first night it was offered.

With this sudden success of a floundering area I realized the benefits of a joint endeavor between teachers. At sixth period each day my ceramic area was open, since I was teaching a class in mechanical drawing. Since the art teacher wished to bring his students into that area for a unit in modeling and sculpture, I gave him a specific area to store his projects. In this case I felt we did a vast service to each other and the students involved. It also helped justify "the use of building and equipment" that we sometimes face with our school boards.

Since this experiment, I have found the art teacher very helpful in teaching color and design in industrial arts. Perhaps I should go back to "manual arts" and cover up my head, but somehow I'm beginning to feel that there's more to this joint teaching than meets the eye. Two teachers working together often inspire each other. There is a practice already established by some colleges of sending certain seniors to practice teach in secondary schools. This practice has proven to be extremely meritorious; whenever two or more are working together to solve a common problem, the results are always far superior to individual efforts. There are many experiments and innovations that need to be explored in the field of human relations. The implications involve the whole system of education.

Team Teaching for Enrichment

Research, skill, automation, and related information are but a few of the problems encountered within our own field of industrial arts teaching, but, like myself, many teachers have a limited amount of knowledge. I do not wish to infer that we are incapable of teaching the full extent of our subject, but I do say that we are all limited in our knowledge and that in some of our areas we may stand to gain or profit by "working together" with our fellow teachers.

In our world struggle today, the most pressing need, so urgent that our survival depends upon it, is that of human relations. Industrial arts teachers can lead and play an important role in promoting this basic factor of success. □

how -to

How to Use a Flannelboard

DAVID P. BARNARD

□□□ *The third installment in a series of articles designed to indicate to I-E instructors how to upgrade their teaching techniques. This article considers the flannelboard.*

Are you looking for ways to add variety to your teaching techniques, which — at the same time — will stimulate the interest of your students during the presentation of essential technical or general information? Do you want a teaching method that will offer to students participation in discussion and also provide action during a lesson? Then why not consider the flannelboard or feltboard? Movement of flannelboard pieces during the presentation, addition or subtraction of parts, and even manipulation of pieces by students themselves will add variety, interest, and action to many of your lessons.

Sounds complicated? Well, it needn't be. A little imagination and initiative, combined with a willingness to re-examine your course of study, are the only ingredients required.

But, let's be specific in suggesting how and where this teaching device can be used advantageously in communicating information to students in various types of shop classes.

1. In Electricity

Electrical teachers, in their units on simple circuitry, have for a long time used felt strips in various colors corresponding to the wire color code. Then, with a felt-tip pen, they've drawn a circuit on a piece of flannel and smoothed the flannel piece onto the board. Next, they've asked students to place — in proper position on the diagram — felt cutouts of switches, outlets, transformers, condensers, and other electrical devices.

Dr. Barnard is professor of industrial education and head, audio-visual center, Stout State College, Menomonie, Wis.

2. In Graphic Arts

The printing teacher can readily encourage his students to place letters and figures in their proper "boxes" on a flannelgraph diagram of the California job case. "Lock-up" in printing can easily be taught by use of felt strips, pieces of styrofoam plastic, balsa wood, or masonite. It is especially worthwhile to employ color with the essential elements of the lesson, such as quoins, to make them stand out.

The principle of "build-up" in printing press make-ready can be communicated very effectively by use of the flannelboard. Here, the teacher — working with various colors of felt — lays one piece over another to simulate the application of makeready tissues in an actual printing situation.

3. In Drafting

Floor plans come alive for the architectural drafting student when he places balsa strips, felt strips, or masonite strips on a flannelboard to reproduce a floor plan.. A three-dimensional effect can be achieved with styrofoam, balsa, or masonite pieces cut to scale to represent furniture, fixtures, and "built-ins."

4. In Metalworking

In foundry instruction, the principle of the sand mold is simply and effectively taught when flannel or felt pieces in various colors represent the cope, drag and bottomboard. To depict the inside of a "flask" (composed of the cope and the drag) after the pattern has been removed, pieces of contrasting colored felt superimposed upon the felt piece representing the flask reveal the position of the mold cavity and the sprue.

Such a feltboard presentation should — as orientation — precede the demonstration of a specific operation. However, that presentation should in no way be a substitute for the demonstration or for the requirement that students actually perform the process themselves.

5. In Power Mechanics

Power mechanics instructors can simplify the principles of power transfer for students merely by using felt or flannel cutouts to depict trains of gears, shafts, pulleys, and belts. Power systems may even be "built" on the flannel board, item by item, as the instructor explains the mechanical advantages achieved.

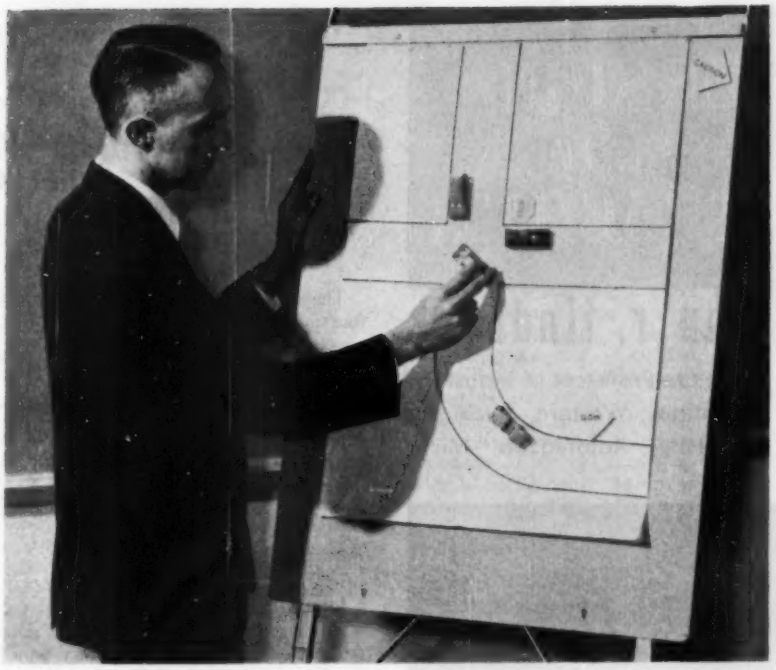
6. In Driver Education

Driver training instructors often use the flannelboard — or its counterpart, the magnetic board — to simulate traffic problems. In this learning situation, students are called upon to solve problems by moving across the board sandpaper-backed felt cutouts or magazine pictures of automobiles. Plastic cars with small permanent magnets glued inside work well on the magnetic board. In the

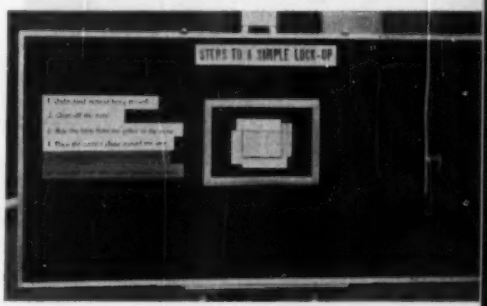
latter case, the instructor may, with a sheet of newsprint and a crayon, reproduce a basic traffic diagram and then hang the sheet over an appropriate piece of sheet metal. Whether his choice has been feltboard, flannelboard or magnetic board, his technique is the same.

7. In Flow-Chart Presentations

The flannelboard lends itself especially well to the construction of flow charts. For example, the metals teacher can readily teach the lesson, "From Iron Ore to Steel," by employing cutouts to symbolize iron ore pits, ore cars, ore loading docks, ships, blast furnaces, and rolling mills. Many times, presentation of such simplified, related information prepares the learner to absorb later, more detailed explanations. As a case in point: the physical arrangement of most paper mills makes sequential observation of each step in the papermaking process a virtual impossibility. Thus, a good flannelgraph presentation before the field trip to a paper mill, or prior to students' viewing any motion picture of a technical nature, orients them so that they gain more from their actual plant visit or the viewing of a film.



Above: Mr. Robert McMurtrie of the Stout Audio-Visual Center illustrates the use of a magnetic board in driver training. (Magnets are in the cars.) Below: a flannel board set-up to demonstrate in differently colored strips procedural steps in a "simple lock-up."



How to Produce the Aid

Where can you obtain a feltboard or flannelboard? Why, your own shop probably contains most of the basic materials. Any convenient stock — beaver board, plywood, heavy cardboard, or chipboard — will provide an excellent base. Size is optional, depending upon the type of lesson you plan to present, although a board 3 by 4 ft. is fairly standard. You'll find flannel at any dry goods store for only about 40 cents a yard. Then, merely stretch the flannel smoothly over the board and then fasten it to the back with thumbtacks, masking tape, nailed strips, ironing board springs or other convenient fasteners. A frame will keep the board from warping. Felt, in a piece 36 in. wide, retails for about $1.20 a yard. Although more expensive than flannel, felt lies flat and is easier to use, particularly if you intend to make a combined magnetic-feltboard and use sheet metal for backing.

What should you choose for "cutouts"? Well, a multitude of objects will cling to flannel, particularly if the board can be propped at a slight angle in a chalk tray or on a desk. Balsa wood, masonite, construction paper, sponges, styrofoam, cotton, yarn, pipe cleaners, felt ($1 for five 9 by 18-in. pieces in different colors), and flannel are some of the materials that will adhere nicely to the flannel board or the felt board.

Backing materials for photographs, pictures, art work and three-dimensional material are equally inexpensive and available. Merely dry mount a piece of abrasive paper of any grade to the back of the illustrative material. Casein or animal glue, or even household cement, will also work satisfactorily as a backing adhesive.

Letter your words by hand or machine, or print them on cardboard strips. If you plan to change words frequently, you may want to coat the smooth side of the masonite strips with blackboard paint. Then you can write and erase on these strips as you would on any chalkboard.

For special, dramatic effects, you'll discover that pieces covered with fluorescent paper or fluorescent paint are particularly effective. Then as ultraviolet light, or "black-light," is directed at the board in a semi-darkened room, students will literally sit on the edges of their chairs to follow your presentation.

You claim that you are already doing too much work to consider making a flannelboard? Perhaps, then, in your classes there are a few exceptional students who are always "done first." Challenge them! Assign to them responsibility for creating a feltboard sequence as a special "problem-solving" project.

Whenever you are preparing a lesson which utilizes a flannelboard, merely place the pieces in order, number them on the back, turn over the pile, and you have a ready-made outline and visuals — all in one package. You may now gear your presentation to the speed of your learners: stop, back-up, review, test, and involve the student directly in the learning process.

Storage of flannelboard presentations is easy. In file-sized envelopes, store the felt, flannel, or other materials for a particular presentation. On the outside of the envelope, be sure to number and identify all pieces. If you wish, enclose your notes for that lesson and then insert the envelope into your instructional materials letter file. Numbering the envelopes and keying them to your course of study completes the storage job — and makes your whole presentation available at a moment's notice.

Add Variety in Teaching

Vitalize, motivate, *communicate* by utilizing in your teaching the flannelboard, feltboard, magnetic board. You'll soon discover that variety has become the spice of your teaching life! □

DESIGN for the TEACHER

Design Guideposts – Materials

john r. lindbeck

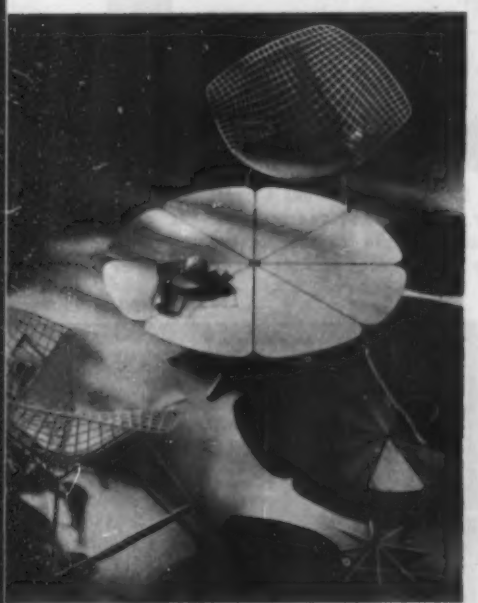
Associate Professor of Industrial Education, Western Michigan University, Kalamazoo, Mich.

The first of the design guideposts, function, was treated recently in this magazine (See pg. 26 of your IA/VE for June.) Function must be considered when analyzing a problem or task; it involves the quest for information relative to the use or purpose of the project. A second guidepost, materials, must also be given some thought when analyzing a task.

Material Requirements

The project or product should display a simple, direct, and practical use of the substance of which it is made. The designer should achieve maximum benefit from a minimum amount of materials. If this element of wise utilization is present, the structure of the product will be sound; it will be as strong as is necessary without any waste of materials or excess bulk.

Questions of integrity and respect for materials might well be raised when a soft wood is stained to appear as a hardwood, or when metal is finished to stimulate wood or marble. In like manner, applying uncalled-for decorations or enrichment to alter the appearance of a material is, in most cases, questionable. Each of the many materials, both new and old, has some inherent qualities which should be exploited to the fullest; only through a mature attitude toward them can one discover what they can be properly made to do. Metals can be bent and folded and formed. So can plywood and plastic and some other materials. Some materials can be soldered, welded, riveted, and glued, others cannot. A working knowledge of the limitations of materials manifests itself in many ways: because of the softness of pewter, surface ornamentation is kept at a minimum or disregarded completely; because plastic becomes pliable when heated, the compression, vacuum, or manual forming methods are far preferable to cutting, squaring, and cementing methods. Materials should not be subjected to wild experimentation. They should be studied and tried; they should be used for their own intrinsic qualities.



— Knoll Associates, Inc.

As one begins to visualize the form of a particular object being designed, he will immediately become aware of the relationships between the material and the process. When the form for a chair suggests a contoured, body-fitting shape, the shell-molding process so typical of the plastics industry offers a logical means of realizing this shape. Plastic is a logical material and, the special molding treatment is a logical process; the two are closely related. Steel could also be used, as could wood. The molded shell offers a resilient, strong, and very practical solution to the chair problem, as illustrated in the photograph. The visualized form must be right for the purpose of the object, and must grow out of the qualities of the material. Form and material always have this interdependence.

Studying and working with materials can be most rewarding, for the designer can learn of the myriad possibilities in combining several materials in a practical and interesting manner: the petal tables feature cast iron bases finished in rust-resistant white plastic; the grain pattern of the redwood petals is emphasized by their radial placement in the top; and the formed wire chair with the smooth upholstered seat provides for an interesting textured contrast. These materials are sensitively employed, resulting in a furniture group well suited to gracious outdoor living.

Too many materials employed in one

(Concluded on page 54)

A SIMPLE WATER SKI CLAMPING JIG

JAMES SCHILLEMAN
Pilgrim Park Junior High School
Elm Grove, Wis.

The clamping jig pictured is an inexpensive, simple jig for bending and clamping laminated ski tips while the glue sets. The material cost for this jig is approximately four dollars and requires two to three hours to construct. As is shown by the photograph, this device requires only one or two large handscrew clamps for pressure which obviously is advantageous over those having many bolts and nuts each of which needs tightening. Below is a Plan of Procedure which is suggested for its construction. Also included is a Bill of Materials and a few points to consider when building water skis.

Plan of Procedure

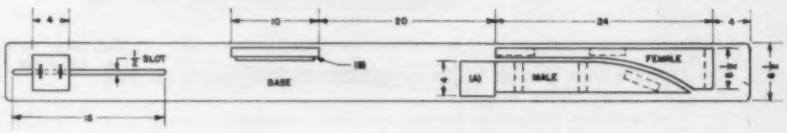
1. Secure materials needed.
2. Cut out base to size and cut slot near one end for adjective length block.
3. Cut out spacer blocks.
4. Draw curve on 6 by 6 by 24-in. forming block and saw out on bandsaw.
5. Sand the curved surfaces of both halves of the forming block.
6. Glue and nail the spacer blocks to the forming block halves as shown in drawing.
7. Fasten the female half of the forming block to the base board using screws and glue.
8. Cut out length adjusting block and bore holes in it for blots.
9. Cut out and attach guide blocks A by B.
10. Apply two coats of shellac to all parts after rounding all arrises slightly.
11. Assemble adjustable block to base.

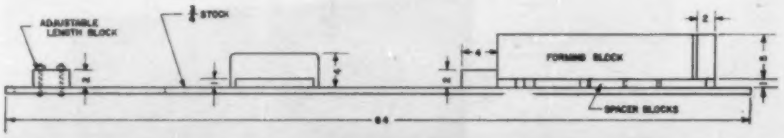
Points to Consider

1. Black ash is a superior water ski wood and 5/8-in. thickness is preferred.
2. The ski blank does not require soaking prior to bending. It should have two resaw cuts; one 16 in. long and the other 13 in. long. These staggered saw cuts prevent cracking when the pressure is applied. Be sure to bend the end of the blank having the straightest grain with the longest resaw cut on the bottom.
3. Cut out the ski tip to its approximate shape prior to bending.
4. Add 1/16-in. veneer (cross grain to ski blank) for added strength and to insure uniform thickness of ski. Apply the glue to these pieces of veneer and insert into saw cuts. Shape these veneer pieces to approximate shape of ski tip. *Clamp immediately!*
5. Use large No. 3 handscrew clamps for pressure. Be sure to check the bottom edge of the ski as well as the top edge to be sure that the tip is properly drawn up tightly. (The clamp jaws should be parallel.)
6. Wipe off excess glue on both edges after pressure has been applied. Allow at least 24 hours for the glue to set before removing the blanks from the clamping jig. □

Bill of Materials

No. of Pcs.	*Name of Part*	*Material*	*Size*
1	Base	Pine	3/4 x 6 1/2 x 84"
1	Forming block	Red fir	6 x 6 x 24"
1	Adj. length block	Fir	2 x 4 x 4"
1	Guide block (A)	Fir	2 x 4 x 4"
1	Guide block (B)	Pine	1 1/4 x 4 x 10"
2	Bolt with washers and wing nuts		5/16 by 3"
6	Flathead wood screws		2 1/2" No. 12
1 pt.	Shellac		
6	Spacer blocks	Pine	1 x 1 x 5 1/2"

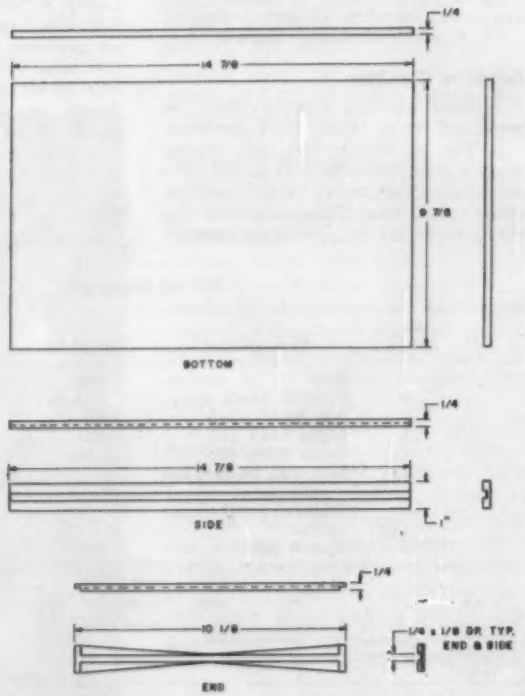


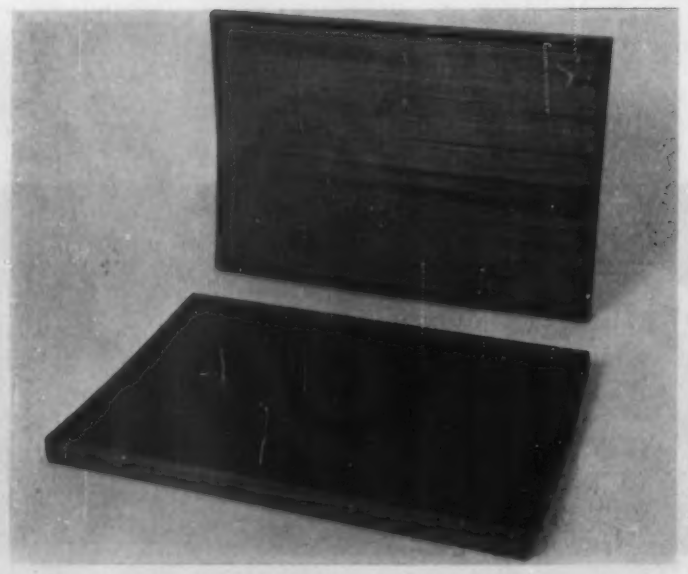


project design sheets

GILBERT R. HUTCHINGS and JOHN R. LINDBECK
Associate Professors of Industrial Education
Western Michigan University, Kalamazoo

A REVERSIBLE TRAY





The tray design suggested here presents a sensitive solution to the problem of providing a simple yet adequate carrying surface. Trays should be light, easy to pick up, and set down; they should insure against the accidental slipping of the contents. The surface itself should be stain-resistant and durable.

This tray meets the above requirements. In addition to actually being light, it has the appearance of lightness and grace. The contoured finger grips diminish the bulk of the end pieces, as well as providing a means of grasping the object.

The surface can be made in several ways: it can be a piece of ⅛ or ¼-in. masonite, lacquered on both sides; it can be a solid piece of wood; it can be a sheet of masonite lacquered on one side, with a piece of veneer glued to the other; or it can be a piece of wood with a piece of plastic laminate bonded to it. Both the choice of surface and the shape of the sides and ends can be left to the discretion of the student. The instructor can set the stage for the designing activity by offering "a" solution to the problem, as presented here. Through an analysis of the requirements for tray design, the students can be assisted in developing designs of an individual nature, thereby moving away from stereotypes.

It can be noticed that the design is also sound from the production standpoint; all cuts (other than the standard crosscutting and ripping operations) can be made with a ¼-in. dado saw, thereby eliminating the necessity of multiple setups or changing blades.

Plan of Procedure

1. Obtain stock for tray bottom; one

piece, rough size 10⅛ by 15⅛ in.

2. Joint one face.

3. Plane to ¼-in. thickness.

4. If desirable adhere a piece of plastic laminate to one side with contact cement.

5. Re-plane to thickness. If a plastic laminate has been used, put this surface down on a piece of ¾-in. plywood to feed it through the planer; this will avoid scratching the laminate. When setting the depth of cut, be sure to compensate for the ¾-in. plywood.

6. Square the bottom of the tray to finished size, 9½ by 14⅞ in.

7. Obtain stock for sides and ends; two pieces ⅜ by 1¼ by 26 in. (rough dimensions).

8. Plane the two pieces to finished thickness by placing them on a piece of ¾-in. plywood to prevent them from curling up and being chopped up by the planer cutter head.

9. Rip to width allowing for a jointer cut to remove the saw marks.

10. Cut off the pieces to finished length. One side and one end can be gotten from each piece. Screw or clamp a piece of wood on the miter gauge to back up the stock when crosscutting to length. This will eliminate tearing the bottom corner of the stock.

11. Cut a groove in each piece. Use the outside cutters of the dado head to get a flat bottom on the groove, thus allowing the bottom panel to be seated to maximum depth for greater strength when using light material. As a safety factor and to insure greater accuracy it is recommended that two feather boards be used when grooving. Clamp one feather board to the fence to hold the stock down; the second should be clamped to the table to hold the stock tightly against the fence.

12. Cut the rabbets in the ends immediately after grooving, using the same depth of cut as for grooving. Cut the rabbet about 1/64 in. longer than the necessary ¼ in. This will permit the joint to be sanded flush after the tray has been glued up.

13. Lay out the desired finger-grip contour line on the end pieces and jig saw. Both pieces may be sawn at the same time, holding them together by driving some ½-in. wire brads into the waste stock.

14. Draw file the jig sawn edges.

15. Sand the inside area of all pieces with 5/0 (180 grit) abrasive paper before the pieces are assembled.

16. Sand the tray bottom with 5/0 (180 grit) abrasive paper.

17. Assemble the tray dry and make sure all joints fit properly.

18. Assemble, glue, and clamp.

19. Sand the outside with 5/0 (180 grit) abrasive paper.

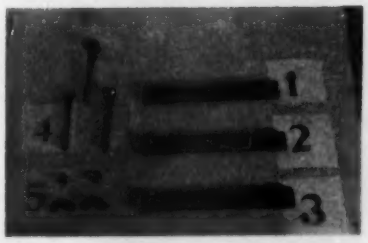
20. Finish as desired. □

HAND BENDING BRAKE

LEON I. REISSMAN
Teacher, Industrial Arts
J.H.S. 12, New York City

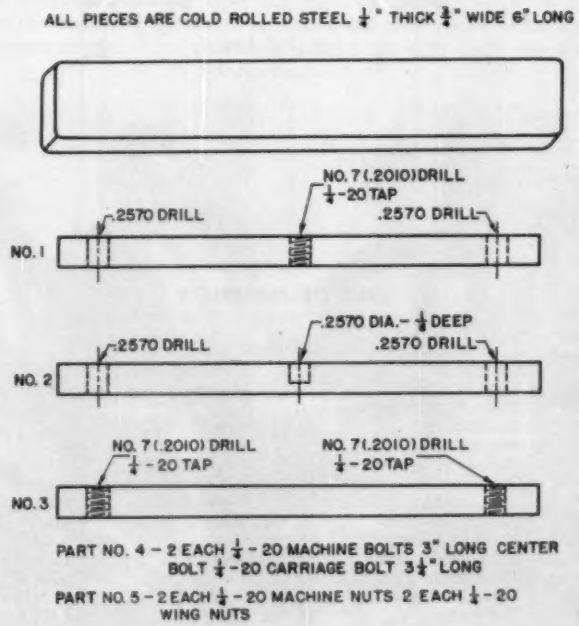
This compact and portable sheet metal bending fixture is simple in its construction. Yet it enables the user to bend metals into intricate shapes and forms. Sufficient holding pressure is exerted upon the middle bar (by the carriage bolt) to hold and accurately bend metals up to about .050 thickness.

This project lends itself very easily to the 9th-year metal shop in a junior high school as an advanced bench job. The teacher can stress the importance of accuracy of layout, hand tapping, and other bench jobs. In addition, in a vocational high school, the instructor can also adapt this project to various machine shop jobs. □



Bill of Materials

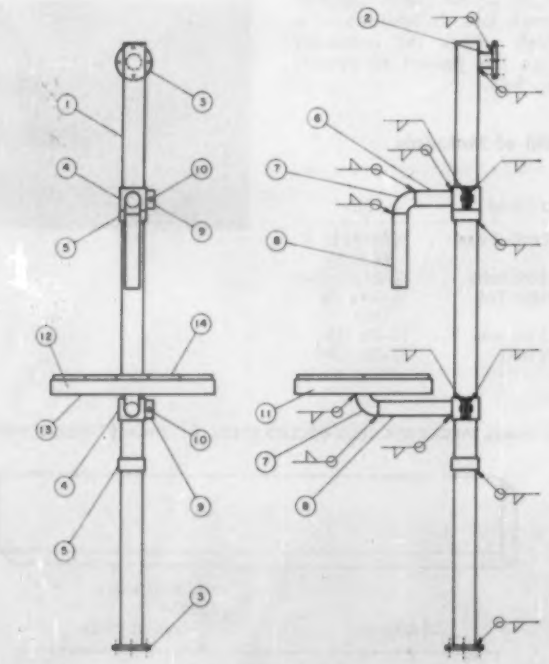
No. of Pcs.	*Material*	*Size*
3	Cold rolled steel	¼ by ¾ by 6" (1, 2, 3)
2	Machine bolts	¼–20 x 3 (4a)
1	Carriage bolt	¼–20 x 3¼" (4b)
2	Machine nuts	¼–20 (5b)
2	Wing nuts	¼–20 (5b)


ALL PIECES ARE COLD ROLLED STEEL ¼" THICK ¾" WIDE 6" LONG
NO. 7 (.2010) DRILL
¼-20 TAP
.2570 DRILL
.2570 DRILL
NO. 1
.2570 DRILL
.2570 DIA.– ⅛ DEEP
.2570 DRILL
NO. 2
NO. 7 (.2010) DRILL
¼-20 TAP
NO. 7 (.2010) DRILL
¼-20 TAP
NO. 3
PART NO. 4 – 2 EACH ¼-20 MACHINE BOLTS 3" LONG CENTER BOLT ¼-20 CARRIAGE BOLT 3¼" LONG
PART NO. 5 – 2 EACH ¼-20 MACHINE NUTS 2 EACH ¼-20 WING NUTS

ARC WELDING TABLE

LOUIS L. JOSSERAND
Co-ordinator of Industrial Education
Bloomington, Ill., Schools

Upon completion of our new senior high school metals shop we were faced with the problem of providing new or supplementary equipment in addition to that which we had been using under previous conditions. Designing and constructing arc welding tables became our first challenge for improvement in that area. There is no more worthwhile educational experience than that of working on equipment which will become a part of the school when completed and is for the benefit of others.



The table shown here was designed with three objectives in mind:

1. To be functional and serve as a convenient and comfortable place to work
2. To be constructed economically by utilizing as much as possible readily available materials
3. To occupy a minimum space and designed for good housekeeping.

The size of the table can be varied by enlarging the width and length of the top in accordance to the standard size of the bricks. The tack-weld support and table have several advantages in that they can be adjusted to varied heights and moved to any horizontal position. The tack-weld support arm (No. 8 on the drawing) which is used to support metal for overhead welding exercises should be replaced occasionally. This may be done by cutting off and welding another piece of pipe in its place.

All pipe fittings are welded together. Threads are removed from the 2½-in. steel couplings so that they slip over the 2¾-in. pipe. The 2¾ by 1 by ¾ in. steel flanges are to be welded to the 2½-in. steel coupling, ⅜-in. holes drilled and mill slotted to make duplicate clamp parts. The angle irons are to be welded together and the boiler plate inserted to form the brick container frame. The table is lastly prepared for painting and may be painted any color to blend with the surroundings. □

BILL OF MATERIALS

No.	*Quantity*	*Item*	*Material*	
1	1	Upright	Black iron pipe	2½ x 82" long
2	1	Wall Support	Black iron pipe	1½ x 1½" long
3	2	Wall and floor plate	Boiler steel	⅜ x 5" diameter
4	2	Coupling	Steel	2½ x 3" long
5	2	Stop collar	Steel	2½ x 1½" long
6	1	Tack-weld support	Black iron pipe	1½ x 5" long
7	2	Tack-weld and table elbow	Black iron pipe	1½" x 90°
8	2	Tack-weld and table arm	Black iron pipe	1½ x 10" long
9	2	Flange	Steel	2¾ x 1 x ¾"
10	2	Machine bolts	Steel	⅜ x 1"
11	2	Table angle irons	Steel	2 x 2 x ¼ x 18⅝₁₆" long
12	2	Table angle irons	Steel	2 x 2 x ¼ x 22¾" long
13	1	Table base plate	Boiler steel	⅜ x 22¼ x 18"
14	10	Table top	Fire brick	9 x 4½ x 2½"

A RESOURCE UNIT ON STEEL MAKING

MAX J. VELLA
Pelton Junior High School
San Francisco, Calif.

The most significant project in connection with this unit is the reconstruction of a large steel making plant. This has served as a valuable learning activity for several reasons.

First, it gave the students an opportunity to demonstrate their craftsmanship abilities. Each section was assigned to an individual or group of students on the basis of student interest.

The class had the opportunity of working with numerous types of materials such as wood, tin, solder, plastic, steel, wire, nails, screws, paint, etc.

The resource unit tells the story of the processing and manufacturing of steel. It answers many of our questions about steel production such as: how the raw materials are brought to the plant, how they are removed from their carrier, where they are then sent, and how important is the location of the plant.

The raw materials are carried on ore boats, which are especially constructed for this purpose. Careful examination will show the iron ore being unloaded automatically by large conveyer belts to railroad cars, which transport it a short distance to the blast furnaces. (These are located in back of the unloading equipment.) Behind the blast furnaces, the steel mills stretch far out along with other buildings.

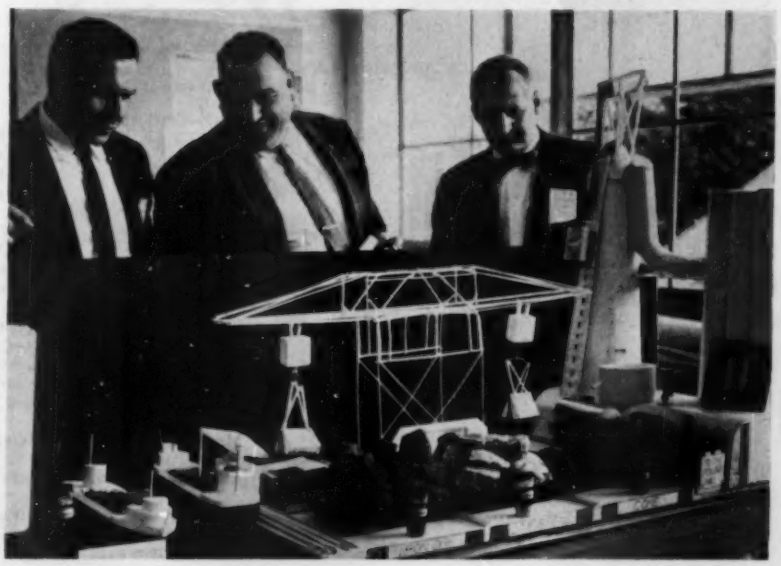
To be a successful steel mill there must be: (a) access to the principal raw materials, iron ore, coal, and limestone, (2) water for cooling and cleaning, and (3) transportation and a market place for finished products.

In the front section of our reproduction the railroad tracks and cars play a significant part because they bring coal and other raw materials important in production, and also take away steel to manufacturers. Miles of additional tracks are located inside the plant to transport the steel to various buildings.

Explanatory cards have been prepared to accompany the project. These serve as self-explanatory guides to other students and faculty members. They explain: (1) how the ore is brought to the steel center, (2) how iron ore, coke and limestone are combined to form iron ingots, (3) how the ingots are then taken to a rolling mill where they are heated, stretched, bent, pulled and punched into various shapes, and (4) how the railroad cars then take the finished steel away which compietes our steel making process.

By studying and reading this unit, a person can visualize and begin to have some insight into the process of steel production. □

The unit on steel making enables students to construct a model (above) of a steel processing plant. And the finished display — with illustrative material on the back and the actual model on the front — furnishes an effective public relations device when viewed by visitors (as shown, far top and below) to I-A conventions, etc.



BUILDING A VAN DE GRAAFF GENERATOR

CHARLES FRANCIS
Industrial Education Department
Western Michigan University, Kalamazoo

Standing only 7½ in. high, this miniature electrostatic generator is a direct descendant of the gigantic atom smashers designed by Dr. Robert Van De Graaff in the 1930's. This baby sized version of the generator is capable of developing 95,000 to 100,000 volts of static electricity. Although the voltage is quite high, one need not worry about safety as the current is extremely low (2–3 microamperes).

As a project, this generator is unexcelled in that its construction involves many of the basic fundamental operations with which every student should become familiar. Some of these operations include the following: (1) cutting and working plastics, (2) cutting and drilling metals, (3) wood turning, (4) soldering, (5) cutting and gluing rubber, (6) wire forming, and (7) mechanical pulley alignment.

Another advantage is that the total cost will be less than $2.50 per unit. The completed unit is excellent for demonstrating such principles of static electricity as the laws of repulsion, electric wind, and several others.

How It Works

The initial charge is produced by the rubber belt as it passes around the lower tape covered pulley. This pulley, negatively charged, repels negative charges from the belt to the lower brush which is grounded to the base. The upper pulley, covered with aluminum foil, is positively charged. This means that negative charges are attracted to the belt from the terminal and are carried down. A collector brush near the top pulley allows the negative charges to jump to the belt easily. A relatively high humidity will decrease the efficiency somewhat; best operation will occur on cold, dry, winter days.

Bill of Materials

No. of Pcs.	*Name of Part*	*Material*	*Size*
1	Aristo-Craft motor		No. 2
1		Sheet rubber	⅝ x 11¼"
1		Plastic tubing	1" o.d. x ⅞ i.d. x 4"
1	Upper pulley	Plastic rod	⅜ d. x ¾"
1	Lower pulley	Plastic rod	⅜ d. x ¾"
1	Aluminum salt shaker		
1	Aluminum pie pan		4¾"
1	Retaining ring	Wood	1" i.d. x 1⅞ o.d. x 5/16"
1	Plastic tape to cover lower pulley		
1	Household aluminum foil to cover upper pulley		
1	Brazing rod 1⅛ in., for upper pulley shaft		1/16"
3	R.h.m.s. with nut for motor mounting		4–40 x ¼"
1	R.h.m.s. with nuts for 1 forward mounting		4–40 x ¾"
2	Bronze window screening for brushes		⅜ x ⅝"
2	Copper wire for upper and lower brush brackets		No. 18
	Model contact and rubber cements		
2	3-volt flashlight cells		

All plastic is available from Allied Radio Corporation, 110 N. Western Avenue, Chicago 80, Ill.

Thin rubber for the belt is available from medical supply shops or local hospitals, in the form of ¾-in. by 3-ft. tubing.

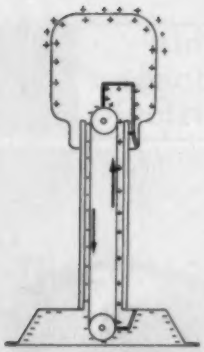


FIGURE 6– HOW IT WORKS

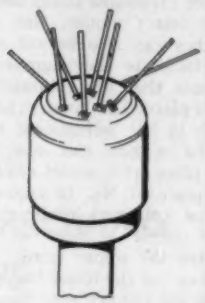


FIGURE 7 – REPULSION

FIGURE 8 – WIRE CAPACITOR

NOTE

2 - 1/4" WIDE RUBBER BANDS CEMENTED TOGETHER MAY BE SUBSTITUTED FOR THE BELT THOUGH THE COLUMN WILL HAVE TO BE SHORTENED SOMEWHAT.

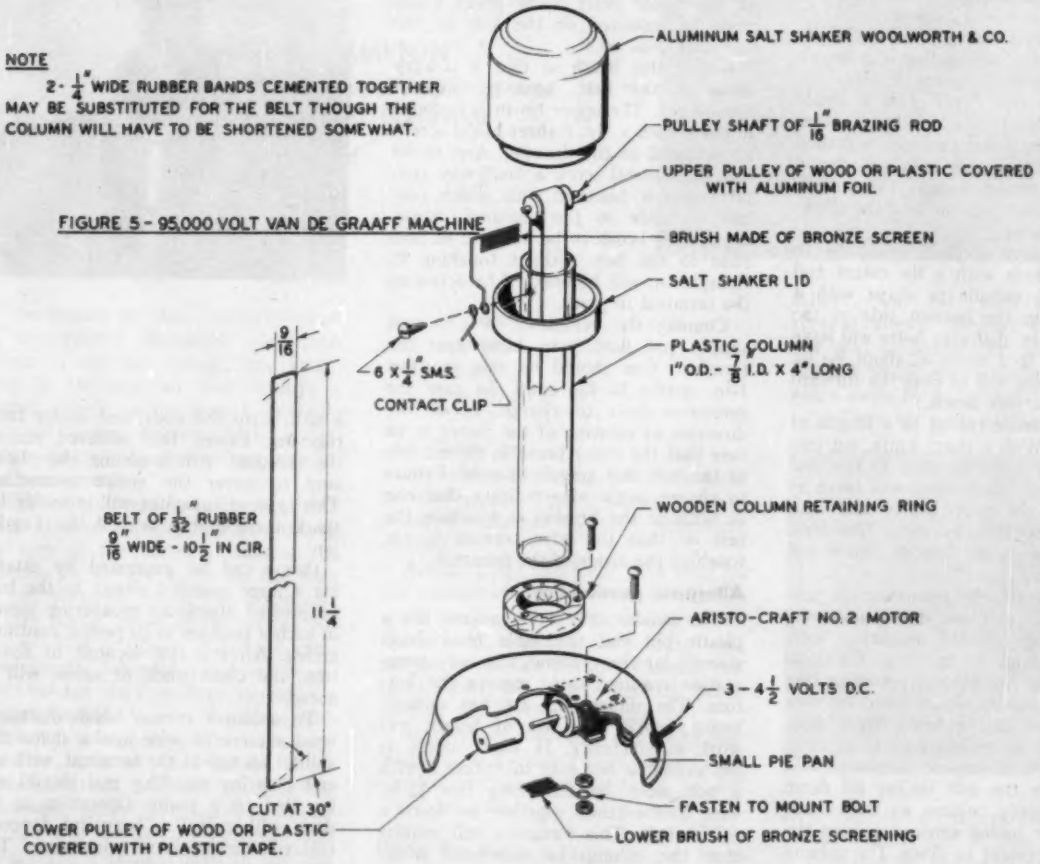

ALUMINUM SALT SHAKER WOOLWORTH & CO.
PULLEY SHAFT OF 1/16" BRAZING ROD
UPPER PULLEY OF WOOD OR PLASTIC COVERED WITH ALUMINUM FOIL
BRUSH MADE OF BRONZE SCREEN
SALT SHAKER LID
PLASTIC COLUMN 1" O.D. - 7/8 I.D. X 4" LONG
6 X 1/4" SMS.
CONTACT CLIP
9/16
BELT OF 1/32" RUBBER 9/16" WIDE - 10 1/2" IN CIR.
11 1/4
WOODEN COLUMN RETAINING RING
ARISTO-CRAFT NO. 2 MOTOR
3 – 4 1/2 VOLTS D.C.
SMALL PIE PAN
FASTEN TO MOUNT BOLT
LOWER BRUSH OF BRONZE SCREENING
CUT AT 30°
LOWER PULLEY OF WOOD OR PLASTIC COVERED WITH PLASTIC TAPE.

FIGURE 5 - 95,000 VOLT VAN DE GRAAFF MACHINE

ALUMINUM MEASURING SPOON
#10 OR #12 WIRE STAND
METAL BASE SOLDERED TO STAND. IN OPERATION, THE SPARK GAP BASE SHOULD MAKE CONTACT WITH THE GENERATOR BASE.

FIGURE 9 – SPARK GAP

FIGURE 10 – ELECTRIC WIND

ROUND METAL TOP
PLASTIC TUBING APPROX. 1 1/4 D. X 1" HIGH
SEVERAL PITH BALLS OR PIECES OF CORK COVERED WITH A THIN LAYER OF CARBON.

FIGURE 11 – JUMPING BALLS

Construction of the Generator

Cut a 1-in. hole in the cap of the salt shaker with a fly cutter. Lay out and drill the four ⅛-in. motor mount holes following with a 1-in. hole in the center of the pie pan base. Also drill a 5/16-in. hole in the side of the base for the motor wires.

Insert the ⅜-in. plastic rod (dowel rod can also be used) in a lathe, drill a 1/16-in. hole to accept the shaft, and cut off at a length of ¼ in. Press a piece of 1/16-in. brazing rod into the pulley, leaving about 5/16 in. protrude from each end. Continue by covering this pulley with a single layer of aluminum foil. Any cellulose or contact cement will be sufficient for this job. The upper pulley is now complete.

Drill the lower pulley to fit the 3/32-in. motor shaft. Cut this pulley to a length of ¼ in., carefully press it onto the motor shaft, and cover with a single layer of polyethylene electrical tape. The column retaining ring can be turned on a lathe. The inside diameter should just fit the column snugly. The outside diameter is about 1⅜ in. and the thickness about 5/16 in.

An alternative method would be to cut a 1-in. hole with a fly cutter and then cut the outside to shape with a band saw. On the bottom side of the ring, two ¼-in. diameter holes will have to be drilled to a depth of about 5/16 in. so that the ring will fit over the forward motor mount bolt heads.

Cut the plastic tubing to a length of about 4 in. With a sharp knife, cut two diametrically opposite slots in one end of the tubing. These slots will serve as bearings for the upper pulley shaft and should be about 1/16 in. deep. Now drill a 3/32-in. hole ¼ in. directly below one of the notches.

Begin assembly by mounting the motor with small machine screws and nuts. (One of the forward mounting bolts should be about ¾ in. long. Continue by cementing the column retaining ring in place so that its center coincides with the 1-in. hole in the base. Again, contact cement is recommended, as it is quite difficult to cement aluminum.)

Now slide the salt shaker lid down over the plastic column so that about 1 in. of the tubing protrudes from the inside and cement in place. The column can now be slid into the retaining ring. However, *do not glue in place at this time*. The next step is to cut the strip of rubber to the exact size and shape as indicated on the accompanying drawing. The belt should be only tight enough to prevent slipping. Apply rubber cement to both *edges* of the angle cut ends and allow to dry. When dry, carefully press the ends together and paint a thin coat of rubber cement over both sides of the joint. After the cement has completely dried, the belt may be installed by dropping it down through the column with the upper pulley in place and slipping the belt over the lower pulley.

To check the belt for proper tracking, momentarily connect two flashlight cells to the motor. If the belt does not track near the center of both pulleys one can place cardboard shims under the appropriate motor mount. One of the upper notches can also be cut slightly deeper to facilitate the alignment job. One will note that the column is still not glued in place. The builder can make use of this in the adjustment of belt tension. The column can now be cemented in place with model cement.

Bend a piece of No. 18 copper wire to the shape indicated in the drawings and solder to it a piece of bronze screening for the upper brush. Repeat this operation for the lower brush, being sure to use the correct wire shape. The lower brush can now be soldered to the ¾-in. mounting bolt at the level of the motor shaft. (The lower brush must be mounted on the side of the belt that goes up.)

Adjust this brush so that it is very close to the belt, however, without touching it. The upper brush is fastened in place with a No. 6 sheet metal screw, as indicated in the drawing. Also under this sheet metal screw a small wire contact strip is fastened with which contact is made to the terminal. Again, adjust this brush to be as close as possible to the belt without touching it. Completion will be effected by screwing the terminal in place.

Connect the generator to a 3 volt supply and hold your hand near the terminal. One should be able to draw 1-in. sparks to his hand. In case the generator fails to charge, check the direction of rotation of the motor to be sure that the lower brush is on the side of the belt that travels upward. Failure to charge might also indicate that one or both of the brushes is touching the belt or that the wire contact is not touching the inside of the terminal.

Alternate possibilities

The builder can, if he prefers, use a plastic pill vial (available from drugstores) for the column. The only preparation required is to remove the bottom. The dimensions are not critical, hence, nearly any size or length will work satisfactorily. If sheet rubber is not available, one may substitute it with a belt made by cementing two ¼-in. wide rubberbands together to form a ½ in. belt. This variation will require that the column be shortened somewhat.

Generator Experimenting

The laws of repulsion can be demonstrated by placing small bits of aluminum foil, paper, or sawdust on the terminal. When the unit is turned on, the material placed on the top will gain a like charge which will cause them to violently jump away. Another demonstration of repulsion can be performed by taping several ⅛ by 2½-in. strips of "Kleenex" tissue to the terminal. These strips will stand erect when the terminal is charged. If the terminal is touched, the paper strips will fall back.

Further experimentation will reveal that Leyden jars can be charged. By using auto ignition wire, one can make an efficient capacitor. Cut a suitable length, strip the ends, and solder them together. Fasten this soldered end to the terminal with modeling clay, being sure to cover the entire connection. This type of capacitor will intensify the spark considerably as will the Leyden jar.

Ozone can be generated by attaching a large rounded object to the base (a pressed aluminum measuring spoon) in such a position as to permit continual arcing. After a few seconds of operation, the clean smell of ozone will be noted.

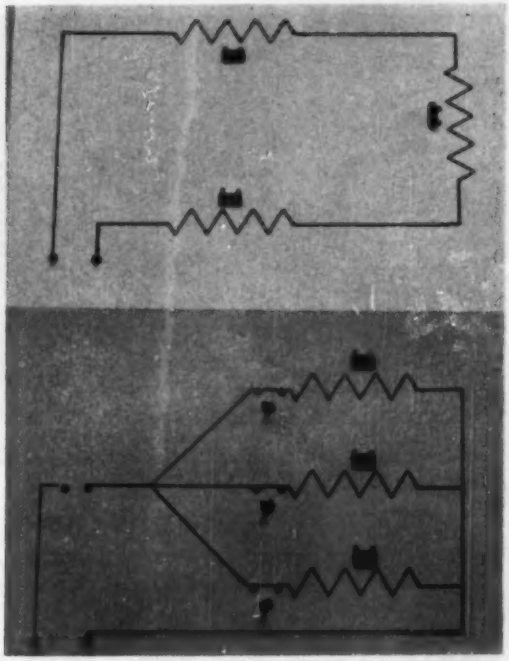
To obtain a corona brush discharge, bend a piece of wire into a shape that will sit on top of the terminal, with one end pointing up. This end should also be filed to a point. Operation in the dark will reveal a beautiful lavender colored corona brush discharge. This type of discharge will also give off the fresh, sweet smell of ozone.

The electric wind effect is demonstrated by making a small pinwheel that will rotate on top of the corona discharge point. Ions at high speed will cause the pinwheel to rotate. The jumping ball demonstration can be performed by placing a 1-in. length of 1¼-in. plastic tubing on the terminal, placing two or three pith balls inside, and covering the tubing with a disk of metal. When the generator is turned on, the balls will be repealed from the terminal and attracted to the metal disk. After a short period of contact with the top, the balls will fall back to the terminal. This action will continue until the metal disk reaches a potential approaching that of the terminal. □

aids in teaching electricity

A TEACHING AID FOR PROVING KIRCHOFF'S LAWS

ISAAC P. HAMPTON
Interim Head, Department of Industrial Arts
University of Florida, Gainesville



Above: the aid, with voltage law section above. Below: the shorting bar and milliammeter, showing how banana plugs are mounted. This enables units to be plugged in and out of various parts of the circuit.

The student of basic electricity needs to comprehend thoroughly the interaction of current, voltage, and resistance in the electron flow through a circuit. Ohm's law deals with this subject. Of similar importance is an understanding of Kirchoff's laws of voltage and current.

Kirchoff's current law states in effect that, at any junction of conductors, the sum of the currents entering the junction is always equal to the sum of the currents leaving. A knowledge of this law is necessary in solving for current flow in bridge and other complex circuits. Likewise, to obtain necessary voltage data in any circuit the student needs to be familiar with Kirchoff's voltage law. This law says that the sum of the voltage drops around a circuit is always equal to the impressed voltage. The following teaching aid was devised to illustrate and prove these important laws to the student more effectively.

Construction Details and Parts List

1. Panel — ¼ by 24 by 32 in. fir plywood, painted with a latex paint. Schematic was drawn with India ink and the surface was sprayed with clear furniture lacquer.

2. Resistors
   Section I (voltage law)
   R_1 — 15 ohms
   R_2 — 30 ohms
   R_3 — 60 ohms
   Section II (current law)
   R_4 — 15 ohms
   R_5 — 15 ohms
   R_6 — 15 ohms
   All resistors are 10-watt wirewound.

3. Meters
   0 — 500 M.A. D.C.
   0 — 10 V. D.C.

4. Mounting

All wiring was done from the back of the panel. The components were installed adjacent to their schematic symbol.

Banana plugs and jacks were used on the milliammeter so that the instrument could be inserted in various arms of the circuit. Shorting bars were employed to provide continuity across the jacks when the meter was not being used in any particular branch.

An ordinary low-range d.c. voltmeter mounted in a sloping-front meter case enabled voltage measurements to be made satisfactorily.

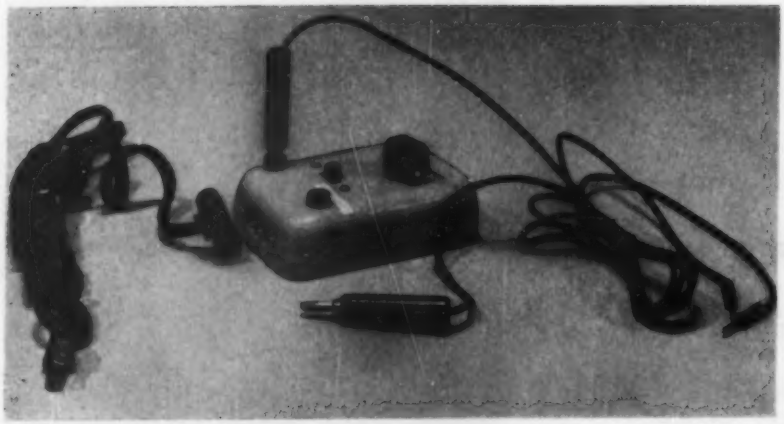
Using the Aid

To illustrate voltage drops around a circuit (Kirchoff's Voltage Law) the panel is displayed on a suitable easel with the voltage-law section up and a battery of 6 to 10 volts d.c. connected to the input terminals. With the proper range voltmeter, total circuit voltage is measured and recorded. It is helpful if a meter with as large a face as possible is used so that all students may view the reading.

Next the voltage drops across each individual resistor, is measured and likewise recorded. By simple addition the sum of the voltage drops is seen to equal terminal voltage; thus the law is proved.

For illustrating Kirchoff's Current Law, the circuit is energized with a similar battery. It is seen that there is provision on the panel for inserting the milliammeter so as to measure current across each branch and also total circuit current. First the shorting bars are inserted in the branch circuits so that each is continuous, and the milliammeter plugged to indicate total current flow. The meter is then inserted in each branch in turn to read current through that part of the circuit. Shorting bars are used to complete all circuits except the one being indicated by the milliammeter.

Again, by simple addition the sum of the branch circuits on one side of the junction (current leaving) is shown to be equal to the current on the other side (current entering), thus proving the law. □



THREE-WAY TESTER

PHILIP W. RUEHL
Associate Professor of Industrial Education
Stout State College, Menomonie, Wis.

Here is a tester* that includes in one compact unit a voltage checker, a continuity tester, and a hot wire tester. Yet the cost of this useful, but easy-to-build. device is only about $1.20.

Feasibility of construction and usefulness in the classroom-laboratory are evident from the fact that student teachers in training at Stout State College built a number of these testers. The apparatus was then employed very successfully with electricity classes of Menomonie High School.

To operate the tester as a voltage checker, a student merely throws the switch to the right. Then, by using the probes and turning the calibrated potentiometer until the light on the tester goes off, he can check the voltage of a circuit.

To operate the instrument as a continuity tester, one throws the switch to the left. When probes are used on a circuit and the light flashes on, it is evident that the circuit has continuity.

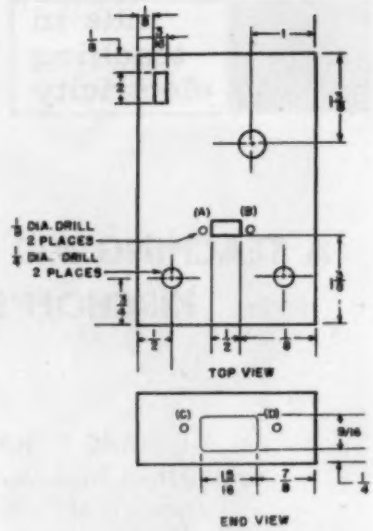
Operation of the device for the "hot wire test" is much the same as for the continuity test. The only different technique employed is the fact that the plug is not connected to current. Instead, when the probes are applied on a circuit through which current is passing, the tester light will glow.

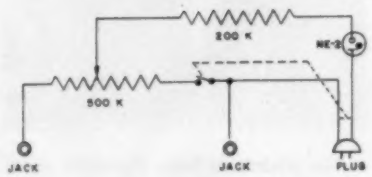
Construction Notes

After the student cuts out the hole for the switch and male line plug, he uses a ⅛ in. drill for holes A, B, C, and D.

If facilities are available for forming plastic for the outside cover, the completed project will look very much like a commercial product. However, if such facilities are not at hand, any appropriate-sized, nonmetallic box will suffice. □

* Assisting Mr. Ruehl were Allen Tegt, Robert Wernsman, James Nelson, and Vernon Knox, students at Stout State College, Menomonie, Wis.



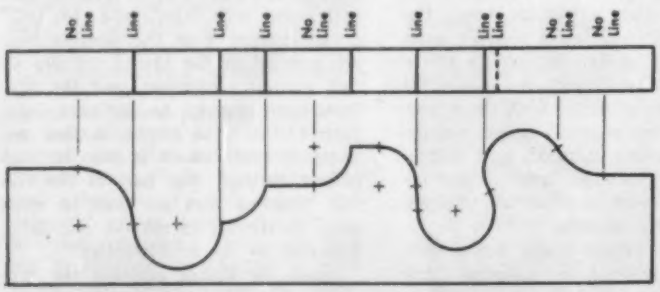


Bill of Materials

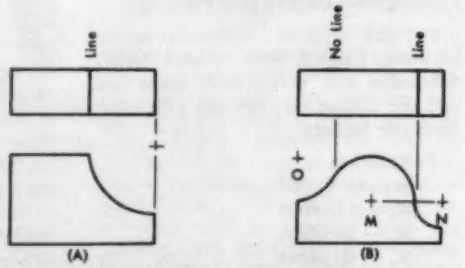
Quan.	*Description*	*Size*
2	Banana plugs	
2	Test probes	
1	Neon test light	750 volt
1	Resistor	220,000 ohm
1	Potentiometer	500,000 ohm
1	TV cheater cord and socket	
1	Connection wire	12 in.
2	Banana plug jacks	
1	Two-way switch	
2	Test lead wires	24-in. pieces
1	Plastic box	2 ½ x 3 x 1 in.

ENGINEERING SPECIFICATIONS FOR ROUNDED EDGES

RICHARD L. BURNS
Department of Engineering Drawing, University of Missouri, School of Mines and Metallurgy, Rolla

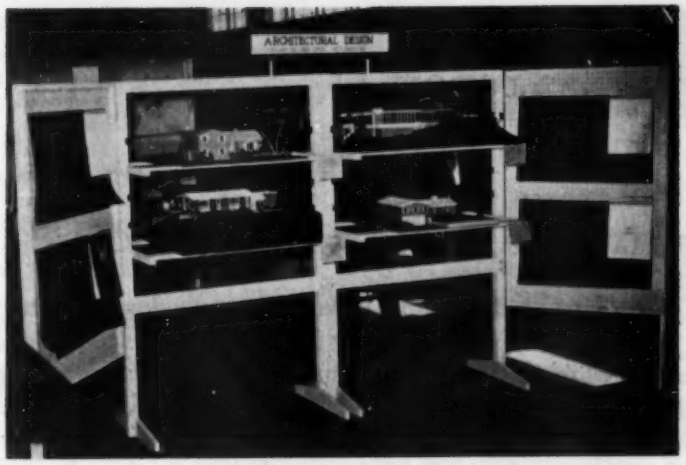


The figure above shows the suggested treatment of rounded surfaces as to when they appear as a line or do not appear as a line. Draftsmen in industry and particularly beginning draftsmen often are puzzled by such rounded surfaces and do not know the correct procedures.



When a rounded surface intersects a plane surface, the line of intersection must be shown (Example Figure A). When two rounded surfaces are tangent a line is necessary when the center N is on the same level with or lower than the center M (Example Figure B). Note that no line appears when the O is above the center M (Example Figure B).

DISPLAYING THE ARCHITECTURAL MODEL



HERBERT C. SIMONSON

Mechanical Drawing Instructor
Central Bucks High School, Doylestown, Pa.

Student-built models of houses have always gained wide spread public interest when displayed in banks, real estate offices, drafting supply stores, and home shows. However, the architectural model is not the easiest thing to display well, and the job is even harder when the plans are displayed with the model.

The model house on a landscaped plot of ground requires a good deal of table space. Two or three models will require a large table. It has been the author's experience that most places of business do not have adequate table space, and, in many cases, do not have display tables at all. This situation can present a serious problem, for in spite of the instructor's desire to display his students' work well, the end result may be a poorly displayed exhibit that might not be welcome again. Only a well-planned, attractively displayed model gives the student proper recognition.

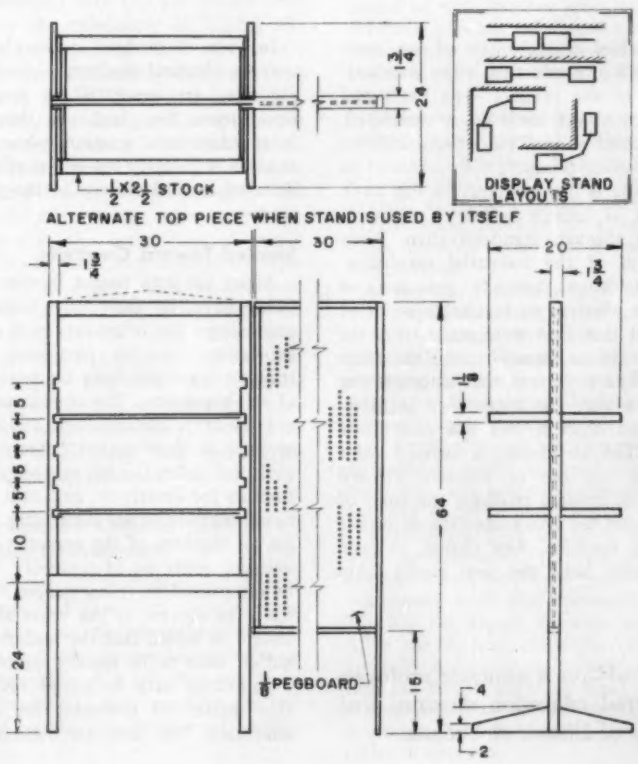
The height of the display above the floor is another matter for serious consideration. Because most model houses contain considerable detail to have them displayed as near to eye level as possible is best. Displaying model houses on ordinary display tables can not give the most attractive affect.

To display plans along with the model house is often desirable so that the public can get some idea of the interior of the house, besides being able to see the scope of the instructor's architectural program. Unless these plans are given special display facilities they become ragged and misplaced. When the plans are displayed in a vertical position fastened at the top they are less apt to become torn and the pages always fall back into their desired order when the exhibit viewer finishes looking at them.

The importance of a professional looking exhibit cannot be overemphasized, for the industrial arts teacher has too long been thought of as the keeper of the school's undesirable students. having a program with no goal other than keeping youngsters out of mischief. It is the responsibility of the industrial arts teacher to educate the public to the truth about what he does teach in his classes. The responsibility for displaying students' work falls squarely on his shoulders. He should perhaps ask for and possibly use some of his students' suggestions, but for the final layout of the exhibit he needs trained adult thinking so that the display can compare with the displays of business's trained exhibitor. Today's advertising media has produced a sophisticated public that expects interesting, attractive viewing. If he is to gain respect, the industrial arts teacher must learn to do a professional job of exhibiting.

Solving the Problem

The display stand illustrated here has flexibility and space saving qualities that ordinary display facilities cannot offer, giving models and plans or just models alone a far better showing. To display models alone the side panels of pegboard may be removed. The entire unit can be completely dismantled and compactly carried in a two door sedan. Obviously the stand can be used to display two or three models depending on their size. Several arrangements of the stands and plan boards are shown to illustrate how adaptable this display idea is to almost any exhibiting situation. □



special report

Individualizing the Project

□□□ *Three guides toward making the individual student project more effective for developing creativity in the learner: (1) an overview which considers what must be done to achieve this goal and, in general, how it can be achieved; (2) a specific reference toward how the project can be adapted to serve students on several levels; and (3) a basic discussion on design and how it can and should be integrated into the concept of the individualized project.*

individualizing the project | an overview

ROBERT A. TINKHAM

The chief characteristic of our modern world of production is the standardization of the product — its parts and the total object itself when completed. As a matter of fact, the superabundance of man-made products that surround us constantly is due primarily to this basic concept of today's industry: mass-production through standardization. Since the days of the industrial revolution, products have shown a peas-in-a-pod likeness which is an inevitable result of the fact that they were made from the same mold or stamped from the same die. While it is true that attempts are made to vary the appearance of mass-produced objects, this has done little more than to change a surface color through the use of different colored paints or through changing the color of the plastic fed into some type of plastic forming machine. Any change in form just waits until the new model takes shape.

Dr. Tinkham is associate professor, industrial education division, University of Illinois at Urbana.

In view of modern industry's insistence on identical products — unidentical examples are separated as scrap and never leave the plant — is there logic in an educational program whose major concern is industry but whose efforts are directed toward variety in the product made?

Slanted Toward Creativity

Many subjects taught in the schools today have, by their very nature, few possibilities for originality and creative expression. One in particular, driver training, leans far from the encouraging of self-expression. The reasons are obvious. History, mathematics, and science, at least in their earlier courses, would rank well down the list regarding opportunities for creativity. And still, educational authorities are constantly reminding all teachers of the necessity for developing every bit of creativity that can be discovered in young people if America is to survive in the years ahead. It should be added that the leaders of this nation seem to be equally concerned.

Industrial arts is indeed favored in this matter of potential for creative education. This does not mean that the industrial arts teacher is looking for more self-expression in the use of a power machine, the results of which could be disastrous. It does mean that he has an almost unlimited opportunity to develop creativity on the part of his pupils in designing at least some of their projects.

In the case of industrial arts projects that are mass-produced, as is done occasionally today, these products will be similar if not identical. In contrast to this newer procedure, most project work involves one individual who completely makes one object at a time. It is here that greater freedom is possible for each pupil can be working on his own solution to the design problem he has selected under the guidance of the teacher. This is reasonable, for it is difficult to reconcile, on one hand, today's educational thinking with its concern for individual differences, interests, and needs and the attention that it gives to problem-solving and creative, critical thinking, and, on the other hand, an instructional program similar to the old manual training approach with its standard projects.

Examination of Conscience in Creativity

If you are uncertain regarding the use of standard, predetermined projects as against individualized projects, ask yourself:

1. In the light of the best current educational thought and my own philosophy of industrial arts, can I defend the use of "set projects" with few or no pupils working on projects which they themselves have designed?
2. Granted that the making of projects is, in a sense, a creative act (something is made or created), is the work of my pupils *really* creative in that they are required to think creatively in problematic situations concerning questions of design and processing or have the problems all been eliminated from their work?
3. Will my schedule and/or facilities preclude a system of individually-conceived projects or, with proper planning, could there be variety without chaos?
4. Am I using an effective personnel system which teaches industrial responsibility, frees me from routine work, and allows me adequate time to help pupils with individual problems such as the developing of their own project ideas?
5. Is my program of such caliber that I make use of "out-of-class" time in requiring that pupils do homework of an experimental nature in the designing and planning of future projects while they work on their current project in class time?
6. Am I almost solely concerned with hand tool and machine skills or am I interested in both manipulative skills and nonmanipulative skills in keeping

with the learner's ability and potential — skills such as those needed in finding answers, in thinking logically, in visualizing form, in seeing relationships, in planning research, in expressing ideas both orally and in writing, in sensing beauty, in making use of past experiences, in using library facilities, and in designing objects for use that function well and please the discriminating eye.

What Has to Be Done

If you hope to individualize the projects made by your pupils, ask yourself these questions:

1. Am I willing and able to exert the extra effort needed in avoiding the cookbook, lock-step approach of a full semester of predetermined, teacher-provided, set projects?

2. Am I myself a creative person in problems involving materials, processes, tools, and power equipment; if not at present, what can I do to develop this characteristic and add this new and important dimension to my effectiveness as a teacher?

3. Would I be capable of advising my pupils in problems of design in which materials, form, color, and texture are organized to serve a certain function; if not, how can I prepare myself for this new responsibility?

4. Can I organize my program in such a way that initiative, creative thinking, and problem-solving rather than conformity, blind acquiessence, and rule-following, are encouraged and rewarded?

5. Can I find a happy balance between learning aimed at the developing of a skill in following directions and learning that requires choice-making on the part of the learner?

6. Am I willing to take a chance on the creative potential which, we are told by authorities in psychology, is found in every normal individual and needs only the opportunity to be developed?

"We've deciphered the terms automatism, cybernetics, mechanization, feedback, and memory drum, but this individual project approach thing still has us stymied."

Guides to Individualized Projects

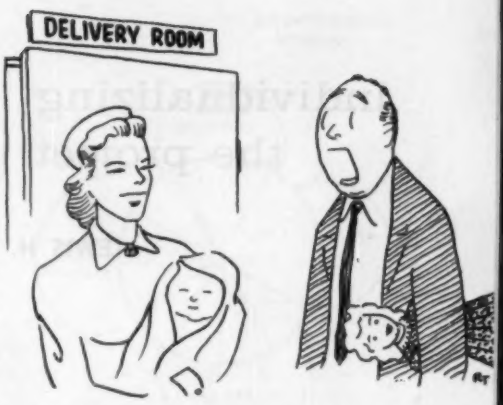
Teaching for more creative individual solutions in industrial arts is not accomplished best by throwing the learner into a confidence-shattering situation in which creativity is demanded.

Industrial arts instruction is not like teaching finger painting in which there is a de-emphasizing of techniques at the outset. It is hard to spoil a finger painting — injuries to finger painters, for all practical purposes, are nonexistent. In a shop situation, on the other hand, the learner wants and needs to know how a tool or machine is used safely and efficiently, what it can do, and what it cannot do. If creative self-expression is to be encouraged in the designing of industrial arts projects, this facet of the overall instructional program in the shop should dovetail with the essential instruction needed to orient the learner to the many aspects of an unfamiliar industrial area such as metalworking. Maximum creativity is not developed on a sink-or-swim basis as might be approved for finger painting with its emphasis on fun and freedom.

A better procedure is found in a more transitional type of approach in which the beginner is encouraged to chose a project design from a number of well-designed alternatives, all of which are similar as to difficulty, basic operations involved, and time needed for completion. In striving for more creative solutions to design problems, the industrial arts teacher should then consider the possibility of having the class as a group design their next project through class discussion which reflects at least one week's thought, observation, and analysis of existing objects to serve the intended function. The visible product of this "group-designing" would be a working drawing of the project which is ready for use by class members. Conceivable, the more creative pupils would have their own individual solutions which should be checked and could be approved by the instructor for construction in the shop. Eventually more and more pupils would join the ranks of those who think through their own design solutions although it is possible that some may never be able to make the break away from dependency on the ideas of others.

Suggestions for Original Thinking in Project Development

In addition to the clues found in what has been said thus far, the following suggestions are offered to the industrial arts teacher who chooses to capitalize on the advantages of a program which, to some degree at least, requires original thinking in the development of project ideas:



"Another boy, but nurse, we already have five identical cutting boards, funnels, shoeshine boxes, letter openers, nut crackers, wrought iron coffee tables, and sailboats!"

1. At the outset, let your classes know that one of your major goals is to help in their creative development since now, more than ever before, we need maximum growth of this kind. Grade pupils accordingly and, within reason, penalize plagiarism.

2. Make use of every opportunity for individual expression within reasonable bounds. For example, even mass-produced objects can be varied in the final stages by the creative ideas of the individual. This has been done with different projects including book racks and pairs of salt and pepper shakers of wood.

3. Record creative ideas on 2 by 2 colored slides for use with classes. There is much stimulation in good slides of manufactured objects and shop-made projects showing a number of solutions to the same problem or showing the steps taken in arriving at a truly creative solution.

4. Use the "brainstorming" technique with pupils in solving design problems.

5. Try puzzle-solving that leads to problem-solving. Puzzle-solving tends to stimulate creative thought which is necessary for the original thinking needed for good design solutions.

6. Learn to accept poor creative ideas as enthusiastically as good ones. The poor ones will not survive examination and will be no problem.

7. Publicize your emphasis on creative development through displays, awards, school and local paper articles, discussions with staff members, etc.

8. Do not expect miracles overnight. After the drop in creativity which, we are told, occurs in children usually before the fourth grade, it takes time to restore confidence and get the learner to overcome his reluctance to reveal his creative thoughts. □

individualizing the project | adapting a specific project

LEWIS H. HODGES

Industrial arts is basically individualized instruction. In addition, by its very nature, it is more flexible than more academic courses. Of late, however, despite its rich heritage and worthwhile contributions, its place in general education has been challenged. Basically, although its exploratory philosophy has been sound, current curriculums in industrial arts have not, in general, adapted sufficiently to the needs of students in the '60's.

Industrial arts has not lived up to its potential in portraying *the image of the industrial culture* (and all its accompanying facets) to the American student. No other program in the secondary school has as great a possibility in contributing to this objective. The wealth of information that can be integrated in (or correlated with) the industrial arts program staggers the imagination. In addition, in no other subject area can such attributes as appreciation, achievement, creativeness, initiative, understanding, skills, co-operative attitudes, etc., be more effectively handled.

What can be done about it? First of all, we must dispel the notion that industrial arts has no challenge for the "collegebound" or the superior student. Industrial arts, if properly taught, can meet the needs of all the children of all the people. Too often our programs have been "pitched toward the happy medium" rather than attempting to meet the individual needs of students.

Recently, considerable heat, but little light, has been generated around the argument concerning the place of the project in the industrial program. Some contend that the project is only a means to an end, while others are equally adamant that the project can be and is an end in itself. It is the purpose of this paper to point out that it can be *both*.

Mr. Hodges is lecturer and teacher-trainer, department of vocational education and practical arts, The University of Michigan, Ann Arbor.

The Superior Student

In order to challenge the gifted and creative student, the project should be only a *means to an end*. In fact, the project might almost lose its identity as such if we are thinking of the traditional and stereotyped term. It might depict a principle of applied science or help solve an answer to a complex problem. The student who chooses to build an abacus, a computer, a telescope, a rocket, or slide rule should be given as much encouragement, direction, and guidance as the student who selects the traditional spice rack, the bookend, or the sugar scoop. This student needs help and guidance (but never teacher domination) in solving realistic problems. He needs to be shown how to get the most out of references, library materials, and other related information. He needs to be encouraged in creative mathematical and scientific inquiry. He needs to evaluate his tentative and final solutions in the proper cultural, social, and historical settings. If his problem is too complex in nature or too involved, he may have to resolve his problem by the "team approach."

However, in this particular case, let us assume that the superior student has selected a traditional project. Let us further assume that the project is a simple wall box planter of Early American design made of white pine. Naturally, a vastly enriched program is necessary to keep up this student's interest. The project in itself will not do this. This particular project is used for illustrative purposes only, and does not mean that the gifted youngster would be held rigidly to the size or the design depicted.

The Average Student

The average student can be challenged, but probably not to the extent of the superior pupil. His creative ability is less pronounced. His imagination does not run as rampant. The project to him is both a means and an end. He may be interested in the characteristics of white pine, but not interested in its cell structure. He appreciates to some extent the design elements, and with help can modify or improve on a design. Creating a design "from scratch" he finds to be an almost insurmountable task. However, there are certain definite rules and principles of design which he can follow with little help.

He can figure his "bill of materials" by the cancellation method, but may be very little interested in other mathematical challenges presented by the project. His main interest is usually in the project and its operations. This, however, does stir his interest in mass production and what goes on in the woodworking industry. His projects many times exhibit skill and careful workmanship, but the principles of applied science and mathematics are of secondary importance and do not have great significance for this student.

The Below-Average Student

The project to this student is the end product. Mathematical and scientific concepts are generally beyond his comprehension. He very often has considerable trouble with his academic courses. Many of his problems stem from the fact that he is a poor reader, and he also has trouble with oral and written communication. Quite often the industrial arts class is his one bright spot in the school day, because here he can reach a certain degree of achievement. Often his craftsmanship leaves much to be desired, but he does make some progress and is encouraged in his efforts because he can see the results in tangible form.

There is little that we can do toward stimulating this pupil toward a greater interest in related technology. However, the teacher has a responsibility in encouraging this person in things of a manipulative nature. The industrial arts class may be his only reason for remaining in school. This student should be encouraged to become interested in extracurricular activities such as industrial arts clubs, 4-H clubs, YMCA craft groups, etc.

The Special Student

According to Conant, the mentally retarded and extremely reluctant learner should not be enrolled in regular industrial arts classes, but should be segregated and placed under a teacher specially trained in this field. The type of activities in these classes would be of an occupational-therapy or sheltered-workshop nature. However, at the present time, as most every industrial arts teacher knows, a few students who would normally fall in this category wind up in industrial arts classes. To this student the project has no meaning, because his lack of ability and short interest span work against its completion. There are *operations* of a

strictly routine repetitive nature that he can achieve some measure of success in accomplishing. Such processes as caning, sanding, rubbing, waxing, polishing, greasing, oiling, deburring, and stripping insulation from wire, are a few illustrative skills in which he can engage under proper direction.

Early American Pine Wall Box Planter

As mentioned earlier, this project is used only for illustrative purposes. Many other projects would be equally as suited to the aim in mind.

The outline below is of two parts. The regular text is considered applicable to both the superior student and the average student. The indented, bold-type portion is considered more adaptable to the superior student.

Geometry and Other Related Mathematics

Geometry has common elements with drafting and for that reason it has been considered separately. Plane geometry is closely associated with mechanical and freehand drawing. We are constantly confronted with angles, squares, rectangles, circles, triangles, etc. Nearly all two-dimensional design is based on these fundamental forms. Three-dimensional design (solid geometry) is based on the sphere, the ellipsoid, the cube, the cylinder, the pyramid, and the cone. The industrial designer keeps these basic forms always in mind, mentally stripping everyday objects of non-essentials and fitting them into combinations of these basic design shapes.

1. What basic shapes are involved in the design of the Early American Pine Wall Box Planter?

2. How do you draw a portion of a circle if you are given two points (the extreme ends of the curve) and the radius?

Mathematics is used in nearly all of the industrial arts activities. The mathematics used in woodworking is rather elementary in that it generally involves only the basic processes. Addition and multiplication (cancellation) are probably used the most in that they are involved in the completion of a bill of material. Mathematics in machine shop and electricity may be somewhat more complex in that trigonometry and algebra may be necessary.

You may find that the word TOWEL may be of assistance in figuring your lumber bill for the Early American Pine Wall Box Planter.

1. If all the dimensions are in inches, write down the word TOWEL, with 12 x 12 (or 144) underneath:

$$\frac{\text{TOWEL}}{12 \times 12} \text{ or } \frac{\text{TOWEL}}{144}$$

Substitute the times or multiplication sign x for O and E.

The formula for board feet would now look like this:

$$\text{Board feet} = \frac{T'' \times W'' \times L''}{12 \times 12} \text{ or}$$

$$\frac{T'' \times W'' \times L''}{144}$$

(T represents thickness, W the width, and L the length [all in inches])

2. If the length is in *feet*, and the thickness and width are in inches, use the following formula:

$$\text{Board feet} = \frac{T'' \times W'' \times L'}{12}$$

3. If the width and length are in feet, use the following formula:

$$\text{Board feet} = T'' \times W' \times L'$$

(This is self-evident in that we already know that a board 1 inch thick and 1 foot wide and 1 foot long contains 1 board foot)

4. If there are duplicate pieces of identical size in the project, the number of pieces is multiplied to one of the above formulas by placing it in the upper part (numerator) of the formula.

5. In similar fashion, the cost per board foot may be added to the formula.

6. The final formula for cost now looks like this (if all dimensions are in inches):

$$\text{Cost} = \frac{T'' \times W'' \times L'' \times \begin{matrix}\text{number of} \\ \text{identical p'cs}\end{matrix} \times \begin{matrix}\text{cost per} \\ \text{board foot}\end{matrix}}{12 \quad 12}$$

Using the *end* of the Early American Pine Wall Box Planter as an example: (see 7 below)

The cost of ends =

$$\frac{1'' \times 4\tfrac{1}{2}'' \times 5\tfrac{3}{4}'' \times 2 \times .28}{12 \quad 12}$$

In actual practice we would probably change the formula to:

$$\text{Cost of ends} = \frac{1'' \times 5'' \times 6'' \times 2 \times .28}{12 \quad 12}$$

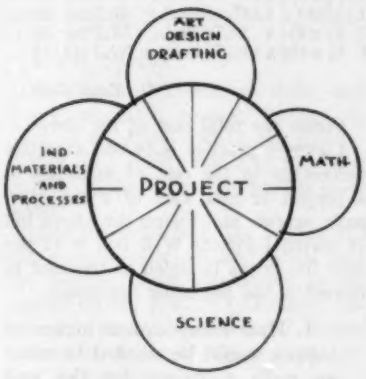
Cancelling:

$$\text{Cost of ends} = \frac{1'' \times 5'' \times \cancel{6}^{1}{}'' \times \cancel{2}^{1} \times .\cancel{28}^{7}}{\cancel{12}^{1} \quad \cancel{12}^{1}}$$
$$3 \qquad \cancel{7}^{1}$$

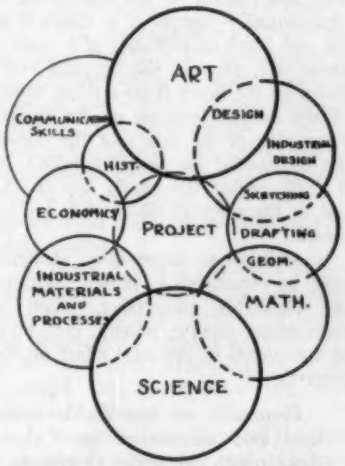
$$\text{Cost of ends} = \frac{35}{3}, \text{ or } 11\tfrac{2}{3}, \text{ or } .12$$

7. The bill of material for the Early American Pine Wall Box Planter is as follows:

THE BELOW-AVERAGE STUDENT



THE AVERAGE STUDENT



THE SUPERIOR STUDENT

THE SPECIAL STUDENT

Quan.	Size	Desc.	Material	Unit Cost	Cost
1	½ x 4½ x 11"	Front	W. Pine	.28	..
1	½ x 9 x 11"	Back	W. Pine	.28	..
2	½ x 4½ x 5¾"	End	W. Pine	.28	..
1	½ x 4½ x 10¼"	Bottom	W. Pine	.28	..
				Total Cost	..

Figure the total cost of the above.

Common practice is to add a certain percentage to the cost of materials in a project to take care of waste, glue, nails, screws, etc. Figure the above bill of material for the Wall Box if 15 per cent for extras is added to the cost as figured in the preceding paragraph.

1. How many square inches of copper would be needed to make an earth container for the wall box?

2. How many cubic inches of earth would the container hold?

Art and Design

Notice that the Early American Pine Wall Box Planter we are considering is symmetrical — that is, it is identical in size and shape on each side of a vertical center line. Observe the "cupid's bow" design on the lower front section. Study all the curved portions of the design. Take note of the fact that the curves end up parallel (or nearly parallel), or at right angles (or nearly so) to the axis of the piece in which they are involved.

In addition to shape other elements must be considered in design. Shadows and highlights, distressing, rolled or worn edges, glazing, joinery, etc., must be considered in the total effect on the observer.

Generally we can divide furniture and accessories into about three rough categories or groups.

1. *Contemporary* (sometimes erroneously called modern)

Quite often have light finish and often associated with Danish, Chinese Modern, or Swedish.

2. *Colonial or Early American*

This style is sometimes considered along with Period furniture (3) and is called "Traditional." Early American furniture is generally made of pine or maple.

3. *Period*

This group includes a large number of styles. Chippendale, Hepplewhite, French Provincial, and Duncan Phyfe are a few of the best known. Pieces are quite apt to be rather ornate with many angles, carvings, curves, complex mouldings, and surface decorations. For this reason projects of this nature should be left to the more advanced cabinetmaker. They are much too difficult for the beginner.

(The reason for selecting a project of Early American such as the Wall Box Planter is because there are definite rules related to its design, while contemporary design is more "free wheeling" in nature).

Suggestions for Advanced Assignment

1. What is the difference between symmetrical and asymmetrical design?

2. Visit a local furniture store or gift shop and observe pieces of Early American design.

3. Why was white pine used by our forefathers in the making of furniture and accessories?

4. Make a number of free hand sketches altering or completely changing the design of the wall box planter. Keep in mind that it must fit the Early American decor and also stick to the original dimensions as much as possible.

5. How would you change the design of this wall box planter so that it would fit into a contemporary setting?

Sketching and Drafting

The ability to sketch freehand is a valuable asset for any beginning craftsman or designer. It is particularly useful in experimenting or "brainstorming" with different ideas and designs. Freehand curves are generally more pleasing than those made mechanically. Sketching is also desirable in making quick perspectives from working drawings. The perspective sketch is more realistic in that it depicts an article as it is actually seen by the eye or camera.

Actual working drawings can be made freehand on square or graph paper.

Drafting implies the use of mechanical instruments. Persons with little art ability can become quite proficient in making mechanical drawings. Orthographic and other working drawings are generally made with instruments.

1. What do we mean by perspective drawings?

2. What are vanishing points?

3. How would you go about finding vanishing points in a completed perspective drawing or a photo?

4. Find the vanishing points in the perspective drawing of the Wall Box Planter.

5. What do we mean by orthographic projection?

Science

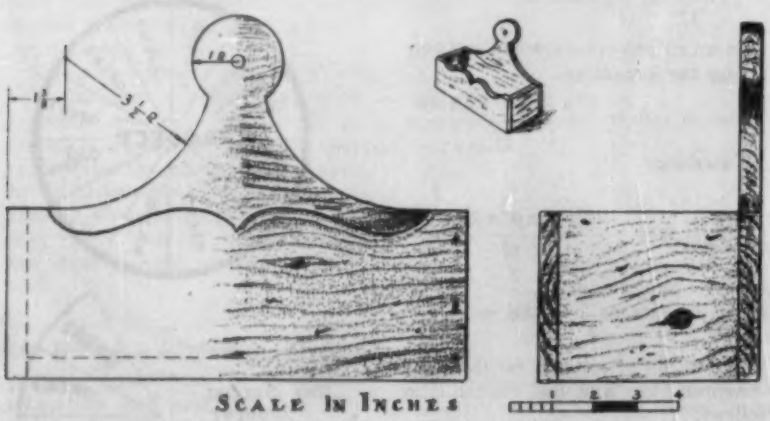
Woods are generally classified in two groups — hardwoods and softwoods. The hardwood trees have broad leaves and shed their leaves in winter. The softwood trees generally bear cones (conifers) and the leaves are needle shaped. It should be kept in mind that not all "hardwoods" (as classified above) are hard, and that not all "softwoods" are soft. However, white pine, the wood that we are considering in this lesson is both soft in texture and is a softwood by classification.

White Pine (Pinus Strobus)

(Also known as Northern White Pine and Eastern White Pine.)

White pine weighs about 27 pounds per cubic foot. The tree often grows to more than one hundred feet in height and up to five feet in diameter. The wood is light in color varying from cream to a light brown. According to Kettell, "unpainted wainscot that has stood for two centuries in a north room with reduced light will often be a startling red-orange, while that exposed to the bleaching process of the sun softens in texture, but remains nearly as light as it was on the day it was installed. This film of age, precious because no artificial reproduction of it is at all to be mistaken for the real thing, is called "patina."

White pine does not split easily, however, it is only moderate in nail holding capacity. It is rather



easy to finish and holds paint very well. It is easy to work with tools but is somewhat brittle. It shrinks and warps but little and takes glue very well. In addition to furniture it is used for pattern-making, millwork, woodenware and novelties, signs, caskets, boxes, crates, matches, shade and map rollers, Venetian blinds, and dairy and poultry supplies.

Assignment:

1. Cut a thin cross section of white pine and view under a hand lens or microscope. What do you see? Define growth rings, parenchyma, rays, resin canals, tracheids, and bordered pits .

2. What are some of the essential differences between Western White Pine (Pinus Monticola) and Northern White Pine?[1]

History

The Wall Box Planter in its simplest form was probably used in colonial days to hold candles. However, in current use it is generally converted to a planter.

"The wall box, as its name implies, is a receptacle that was designed either to hang from a nail on the wall or to rest against the wall on a table or chest or ledge where it might hold, readily accessible, candles, spices, salt, or whatever else the housewife chose to put in it. In its simplest form, it is merely a box without a lid. Then, as the design is elaborated, a lid is added and drawers appear underneath, first one, then more than one, until finally the well, or main receptacle, is eliminated, and the wall box has become what we may call a wall box of drawers.

"From the form of the wall box with drawers there was developed one of the very choicest of colonial furnishings, the pipe box. Into the open box, bowl first, were thrust the long-stemmed churchwarden pipes of clay, or sometimes iron, while a supply of tobacco filled the little drawer beneath. The parts and proportions of the piece became almost as definitely fixed as the features of the human face, and yet no two pipe boxes are alike. Some of them are exceedingly lovely.

"It is hard for us today, with our kitchen cabinets, ample cupboards, and elaborately built in shelving, to appreciate how useful these old wall boxes must really have been. But their usefulness is indicated by the way drawers increased in number until the nail would support no more, and boxes of drawers were built to be stood conveniently on other furniture."[2]

[1] Russell Hawes Kettell, *The Pine Furniture of Early New England*, New York, Dover Publications, Inc., 1929.

Communication Skills (Vocabulary, Spelling, and Word Study)

Pyramid	Decor
Identical	Perspective
Symmetrical	Orthographic
Asymmetrical	Conifers
Radial	Patina
Annualar	Longitudinal
Parenchyma	Tracheid
Prosenchymatous	Tangential
Epithelial	Cambium

Industrial Materials and Processes

"Distressing" is the process of imparting age or worn characteristics to wood artificially. Glazing contributes to this process by emphasizing the natural accumulation of dust in corners and recesses. Distressing is accomplished by many different methods, a few of which are described below. Both distressing and glazing add a great deal to the character of Early American pine projects and are used a great deal in the furniture industry.

1. Rolled (Worn) Edges

The edges of pine projects will naturally become worn particularly if the piece is handled to any extent, because of the soft nature of the wood. This is emphasized by artificially causing the piece to look worn by rounding over the edges where the hand would normally come in contact with the project.

Roll the edges with rasp, or coarse file, or coarse sandpaper, or cylindrical sander in lathe or drill press.

Follow up with succeeding grades of fine sandpaper until no sanding marks are discernible.

2. Worm Holes

Punch small holes with an ice pick and scratch artificial worm holes not more than 3/8 of an inch long.

CAUTION: This can be easily overdone. It is best to be on the conservative side. *Do not follow a definite or symmetrical pattern.*

3. Bruises, Nicks, and Dents

Pieces of chain about 10 inches long fastened to a handle makes a good lash for this purpose. Different shaped pieces of steel should be welded to the ends of the chain. The pieces of the chain will cause bruises and dents, and the pieces of metal will cause deeper nicks. Due to the fact that the chains fall haphazardly will prevent a stereotyped pattern.

[2] *Ibid.*

An even easier way for accomplishing the same purpose is to use a piece of furnace clinker. This is rolled on the piece to cause the same effect as in (1).

4. Fly Specks

Place a small amount of thick, dark brown or black enamel, lacquer, or paint in a shallow dish or can cover.

Pick up a small amount of this paint on the bristles of a stiff bristled tooth brush.

Hold the brush near the project and rub a small piece of sheet metal over the bristles. Small specks will be deposited on the project. (CAUTION: Experiment on scrap stock until desired pattern is obtained. Apply specks before the last finish coat.)

Finishing Early American Pine Projects

1. Sand project. Use 120 (3/0) paper.

2. Distress as desired.

3. Apply shellac. Apply 2 coats of thin (2 lb. cut or thinner) orange shellac. Sand with 220 (6/0) finishing paper between coats. Fine steel wool is used on curve portions, carvings, and turnings. If a darker finish is desired stain entire project with diluted walnut stain before applying shellac, preferably with a spray gun or spray can. If a lighter finish is desired use two coats of white shellac.

4. Glaze. Glaze is applied to the entire project. Glazes can be purchased from most any well known wood finishing company. (A popular glaze for pine is No. 206 from Grand Rapids Wood Finishing Co.) Glaze is a thin, dark pigmented solution.

5. Wipe off glaze. Wipe off the glaze with a soft cloth. Do not rub very hard or attempt to remove glaze from corners or recesses.

6. Blend the glaze. This is the most critical step. Use a dry brush (fitch or sable) and blend the glaze away from all corners and recesses. The gradation of color should be from very dark to much lighter with no distinct line of contrast. Allow glaze to dry from 12 to 24 hours.

7. Apply sealer coat. Apply a thin coat of white shellac, lacquer sealer, or "Deft." (CAUTION: This sealer coat must be applied with a spray can or spray gun as brushing will loosen and smear the glaze.)

8. Apply finish coats. Apply 2 or 3 coats of flat lacquer, flat varnish, or "Deft." Allow for sufficient drying between coats.

9. Rub. Rub with 4-0 steel wool.

10. Wax and polish. A black antique wax is best as it will take care of scratches and mars and will add to the overall *patina*. □

individualizing the project | design

JOHN R. LINDBECK

Any discussion of the project must of necessity concern itself, at least in part, with the problem of designing; the reason becomes evident as one considers the place of design in industrial programs.

Design, in one form or another, has long been important in the field of industrial arts. Almost any set of objectives describing the intent and direction of program will be sure to give some place to design. The reason for such inclusion springs from the nature of industrial activities; namely, that they either involve planning or creating as a prerequisite to action, or that attitudes of appreciation are fostered through manipulative experience.

Smith, for example, in a 1924 monograph[1] lists as a third proposed objective for industrial arts:

"To foster appreciation of good materials and workmanship. (For intelligent and discriminating selection of manufactured products for home and business consumption and proper valuation of substantial and beautiful constructions in environment.)"

In an American Vocational Association bulletin,[2] further reference is made to the importance of design by including it in a suggested list of objectives:

"To develop in each pupil the appreciation of good design and workmanship and the ability to select, care for, and use industrial products wisely."

Part of a recent doctoral dissertation[3] quoted 30 statements of proposed objectives and purposes dealing with the significance of design and its ramifications in industrial arts. Leaders in the field of industrial arts throughout the years of this twentieth century were cited. Some example of these evidences are:

"1. Ericson (24–252). '. . . basic principles and attitudes can be established with young students (even) in a limited amount of time . . . in this increasingly important area (of appreciation).'"

"2. Friese (26–56). '(A justifiable aim of manual arts is to) provide training in industrial art and industrial art appreciation. . . . In this case the art is applied to utilitarian objects which are used in, and surround us in, our daily life. . . .'"

"3. Mays (53–576). '. . . appreciation of materials, workmanship, and design are also values claimed in theory of this (manipulative) work.'"

"4. Selvidge (3–33). '(A justifiable goal of industrial arts is) to develop in each pupil an appreciation of good workmanship and good design.'"

Obviously then, there has long been an awareness of design as a significant part of industrial arts.

Historically speaking, the concept and function of designing, or planning for manipulative activities, was conceived largely as a responsibility of the teacher, with the student generally following the directions as demonstrated or discussed by the teacher. Gradually, this situation has changed so that now the emphasis, to some degree at least, is upon involving the student directly in these planning experiences.

Design Defined

Design, for some persons, means an *ornament affixed to an object.* By painting a rose on a table, they have created a design for that table; by etching a deer head on an ashtray, they have created a design for that ashtray. Design in its contemporary setting, however, transcends this particular concept and emerges as a process — a dynamic, creative, very purposeful planning activity. In this context, design can no longer be equated with ornament or decoration. This modern concept of design has been properly summed up with the statement that *good design must be built into, not draped on.*

By definition, *designing is creative planning to meet a specific need;* to better understand the full meaning of the definition, one must look more closely at the several key words. "Planning" in design means a serious, analytical approach (to organizing one's thoughts and procedures) which results in a logical blueprint to action. However, this is not just ordinary planning but, "creative planning." Creative denotes an original treatment of a problem or task. A person is creative when he does something in his own unique, individual way. Ideas come from many sources; a person's mind is not a blank when he begins designing. He may imagine an idea, or remember an image he saw somewhere, but he is creative only to the degree that the idea is adapted, modified, or altered to meet his specific needs.

It clearly suggests that copying or lifting someone else's work is to be avoided. The work of other people is not, however, to be ignored or disregarded; it can and should be considered a valuable source of stimulation and information, serving to spark the imagination. But creative designing is definitely not copying.

The words, "specific need," indicate the total awareness of the design task at hand. The designed must know *what* he is designing and *why;* he must address himself to a *clearly defined problem* or else he will wander aimlessly trying to discover precisely what will meet his specific need. It is far better to expend one's efforts in the direction of creative planning, rather than in more or less random solutions because the true purpose of the task is not known.

This, then, is design defined — creative planning to meet a specific need. With the purpose of the design problem simply and clearly defined, and with a commitment to an open-minded, creative planning approach, the individual has the stage set for a stimulating design activity. In reading design literature, one is confronted with many different definitions, but they are essentially the same. The important thing to remember is that designing is a creative planning process, a process which culminates in a logical, direct, well-conceived, and well-executed plan to meet a specific need.

Why Design Is So Important

It is interesting to compare the planning experiences which are advocated

(Continued on page 59)

[1] Homer J. Smith, *Industrial Education in the Public Schools of Minnesota* (Educational Monograph No. 6, Minneapolis: College of Education, University of Minnesota, 1924), p. 118.

[2] American Vocational Association, *A Guide to Improving Instruction in Industrial Arts* (Washington: American Vocational Association, 1953), p. 20.

[3] John R. Lindbeck, "A Framework for Research in Industrial Arts" (unpublished doctor's thesis, The University of Minnesota, Minneapolis, 1958), p. 46.

Dr. Lindbeck is associate professor, industrial education department, Western Michigan University, Kalamazoo.

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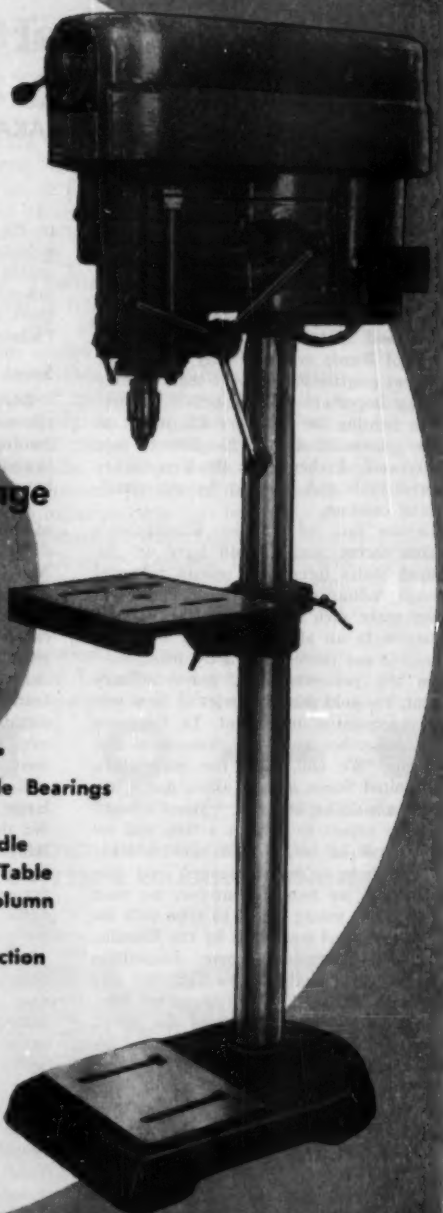

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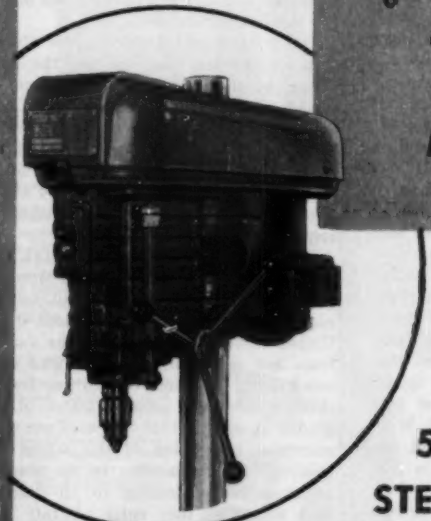

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Some Convictions of a Teacher After a Summer in Europe

T. A. HIPPAKA

Never in the history of the world has brainpower been more important than it is today. Our military, political, humanistic, economic, industrial, and scientific endeavors demand men of courage, intelligence, and mature judgment. The abler youth of Russia are constantly undergoing stringent preparation to serve their country in these important areas of activity. America is fighting for her very life in all of these spheres of action. Needless to say, the tyrannical schemers in the Kremlin are unpredictable and inhuman by our standards of conduct.

In the face of Premier Khrushchev's brazen threat that he will bury us, the United States intends to remain powerful enough, militarily, so that the Kremlin will never make such an attempt. The greatest deterrent to an all-out shooting war with Russia is our powerful military machine.

In the presence of a grave military threat, the cold war continues to be a war of consequential movement. In this area Khrushchev has issued this demoniacal ultimatum: "We will make the imperialists, the United States and its allies, dance like fishes in a skillet, and that without a war."

If we expect to remain a free and respected people, we too will have to ready our youth to fight a prolonged cold war. In fact, if we hope to survive, we must toughen our young people to cope with the ablest personnel sent forth by the Kremlin.

We will always welcome competition from the free world as we fight the cold war with Russia. Fortunately, as we compete with the free nations of the world, fair play prevails in terms of acceptable business standards.

One cannot spend a summer touring Europe without returning home with some rather deep convictions regarding the teaching profession. The summer of 1960 found me on my third journey to Europe since my arrival in America as a boy of eight. As a member of the American military forces, I had served in Europe during World War I. In the 1930's I saw Europe a second time when I was engaged in writing a book on the educational system of one of the European countries.

My journey to Europe in 1960 was made entirely on my own resources. It was done the hard way. I lived with and conversed with all kinds of people. I slept in all kinds of places and ate the fare of the common man. Considerable time was spent in the schools of Europe, as well as the industries on the continent. It was the author's privilege to visit a number of industrial exhibits and to be a special guest at the National Industrial Fair in Finland.

Dr. Hippaka is a professor in the vocational education department, Iowa State University at Ames.

Some General Impressions of Europe

Europe was doing exceedingly well. People were busy. They were well fed and comfortably clothed. There was work in the summer of 1960 and people were quite happy and satisfied.

It is a matter of record that a number of European countries were left literally destitute as a result of World War II. America took it upon herself to come to their rescue. Millions of dollars were poured into these countries with which they purchased American-made goods. Such was our generosity above and beyond the military aid given European nations during the war. Ironically enough, it is calculated that the dictators who intend to "bury us" received over $11 billion worth of military equipment from us during the war years.

European prosperity is due in a very large measure to our generous assistance. No doubt, we could have been more intelligent in our genuine concern for distressed people, but the world can hardly accuse us of being selfish in our humanitarian endeavors. So well has Europe progressed economically, that in the year 1960 we imported more goods from the countries there than we exported to them. Our gold reserves had dipped below $18 billion for the first time in 20 years. It is estimated that the drain on our gold reserves reached four billion dollars in the year 1960.

Free Europe as well as Russia have become a very real competitive force in this world. Industrially and economically, Europe is giving us a "real run for our money." One of America's problems is to keep alert on a full stomach. We are having difficulty in the world markets, for we face the very real danger of being outsold by other nations. Other countries throughout the world are underbidding us in many areas of manufacture at the present time.

European Schools at Work

Our better judgment should never allow us to discount the effectiveness of European education. Nor should we become panicky upon reading reliable reports regarding the schools of Europe. Despite the enormous amount of adverse criticism directed at the public schools of the United States, there is very little wrong with them that cannot be corrected in the free, American way.

Much has been written about the schools of Russia. Qualified Americans, in considerable numbers, have reported authentically on the Russian system of education. No unbiased person can doubt that great improvements have been made in the Russian system of education, especially if these improvements are viewed strictly from the Kremlin's point of view and by Kremlin standards. In order to secure the greatest educational advantages in Russia, the learner, as well as the teacher, must be proven Communists. The teacher instructs, not as a free man but as a Communist. The State is supreme; the individual, whether learner or teacher, is a pawn of the State. Although we Americans want no part of such a system, we must remember that we are in a cold war of unpredictable duration with such an ideology, and that we must constantly gird ourselves to cope with it. As we do so, we need to remember that we are dedicated to the educational concept so appropriately stated by Mrs. Anna Jameson in these words: "The true purpose of education is to cherish and unfold the seeds of immortality already sown within us; to develop to their fullest extent the capacities of every kind with which God who made us has endowed us."

We need to prove to ourselves and to the world that we can reach this high-level goal and still win the cold war against the Russian dictatorship.

The educational picture in free Europe is a challenging one, to say the least. There is much similarity between the schools of West Germany, Denmark, Norway, Sweden, and Finland. By no stretch of the imagination is pupil or teacher a pawn of the state. The teacher instructs as a free man; the student learns as a free, human being. The human personality is respected, as it is in America.

School organization in Western Europe is far different from that of the American educational system. It is difficult for Europeans to picture a high school in the United States with its numerous curriculums and extra-curricular activities sponsored under the same roof. In free Europe, children enter the primary school of four grades at the age of seven. Upon their successful completion of this school they continue their education in an academic grammar school leading to an academic high school or they enter separate home economics, business, agricultural, or trade schools. Upon the completion of an academic high school, the student is prepared to apply for admission to a university. Naturally, students enter their chosen occupations when they have successfully completed the work in their vocational schools. Engineering institutes and schools of commerce on the university level are separated from the universities although they are degree-granting institutions.

West Germany has taken a new look at preparation for citizenship as it is interpreted in the Scandinavian countries and in the United States. Educational leadership in West Germany realizes now that Hitler could not have come into power if the German people had been taught to assume individual and collective citizenship responsibility as it is practiced in the pro-

(Continued on page 51)

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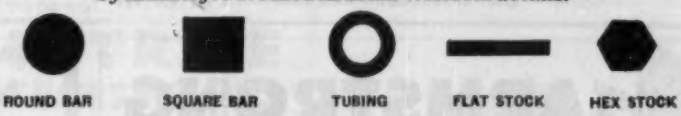

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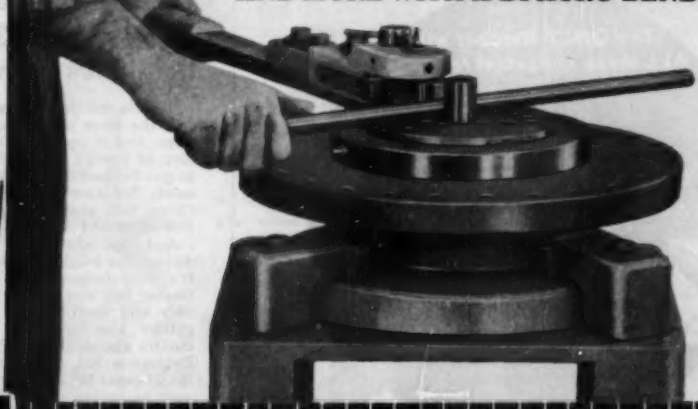

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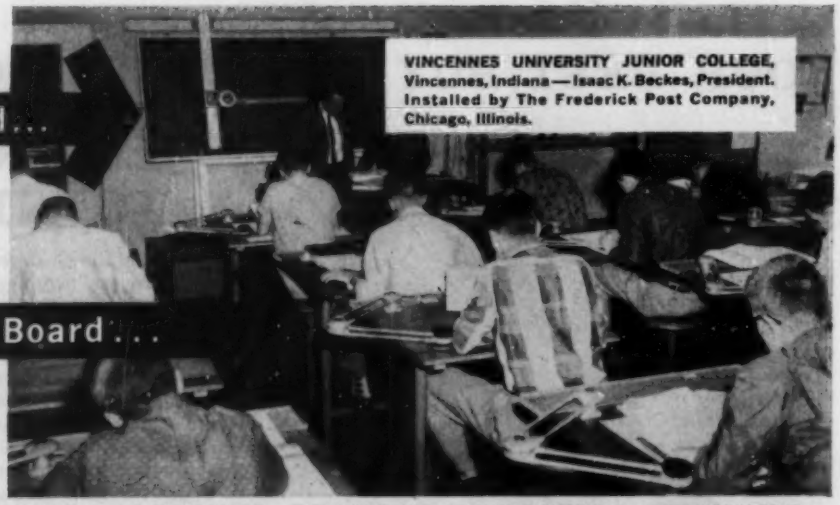

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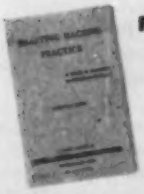

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TEACHER CONVICTIONS

(Continued from page 48)

gressive, democratic countries of the world. The assumption of such responsibility keynotes West Germany's educational system today.

Naturally, the newer schools in Europe are the best. They are well equipped in every respect with equipment made in Europe and in our United States.

Teachers are exceedingly well prepared. They are well educated, in that they possess a splendid balance between breadth and depth received during the years spent in excellent teachers colleges.

Strangely enough, in terms of our professional duties, the sole task of the European teacher is one of instruction. Thus, the extra-curricular duties and clerical chores of an American instructor are literally foreign to the European teacher. He not only devotes all of his time to teaching, but he is given considerable time during each school day to prepare his class presentations.

Effort devoted to study in the schools of Europe is much more arduous than it is in America. Young people from the first grade through high school attend their classes six days each week. The school year is much longer than the school year in America. All students have home work to do from the youngest pupil to the oldest in the public schools. After a strenuous school year, comprehensive subject-matter examinations must be written successfully if the student is to enter the next level of his educational career.

I came home from Europe more determined than ever to implement these words of Daniel Webster which he wrote regarding your profession and mine: "If we build with marble it will perish. If we build with brass time will efface it. If we rear temples they will crumble into dust, but if we build with human minds, if we imbue them with principles, a just fear of God and a love of our fellow men, we engrave upon those tablets something that will brighten to all eternity."

When one witnesses the determination of the people in Europe, you return to America resolved to teach with every ounce of strength at your command. You are going to make clear to your students that they are preparing to save their country and their loved ones in a highly competitive world.

Although the American secondary school teachers are doing a very creditable piece of work with the money, time, equipment, and school plants made available to them, they should be realistic enough to look at themselves critically, in order to truly evaluate their own efforts.

Teacher Self-Evaluation in a Highly Competitive World

1. A lazy teacher generally begets lazy students.

2. Teaching is a high sense of dedication to duty, a way of life, if you please. Without the sense of a mission, it is difficult to succeed in the teaching profession.

3. Teaching is the directing of learning,

(Concluded on page 52)

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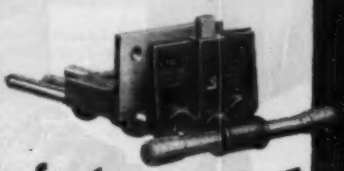

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TEACHER CONVICTIONS

(Concluded from page 51)

for learning depends almost entirely upon the learner's intelligence and self-disciplined effort.

4. We should be more concerned with the genuine needs of the pupil than we are with his likes and dislikes. By the same token the teacher must teach to meet these needs and not to teach what comes easiest for him.

5. Teaching is helping the learner to help himself in the learning process.

6. Teaching is the opening of windows to learning and not the filling of buckets.

7. Teaching is guidance.

8. Teaching is proceeding from the easy to the difficult, the known to the unknown, the concrete to the abstract.

9. Teaching is a teacher-pupil, pupil-teacher, and pupil-pupil relationship.

10. Teaching is helping learners to observe, to detect problems, and to develop ideas as to their solution.

11. Teaching is motivating, stimulating and inspiring young people to discipline themselves in the total learning process.

12. Teaching is the development of "a head of steam" in the learner so that he will continue learning on his own power through life, for we live in a world where there is no escape from continuous self-education, if one is to be successful.

13. The good teacher places a high premium upon the development of character—for skills in the hands of a man lacking character can become a curse.

14. Good teaching necessitates continuity of subject matter and teacher effort.

15. Citizenship looms important to the good teacher, for good citizenship and craftsmanship must become inseparable.

16. The superior teacher "stays on top of new materials" at all times.

17. The master teacher constantly promotes creativeness, resourcefulness, imagination, vision, and an abiding sense of responsibility in his students. Businesses and industries fail where these qualities are lacking in personnel.

18. The master teacher involves his students in the lesson.

19. The effective teacher has certain minimums in mind. He teaches fundamental skills and principles; he hopes that basic attitudes will be caught from him; and he is pleased when his pupils can apply skills and principles to the solution of problems. He is especially gratified when his pupils not only solve problems assigned them, but they can identify problems which need solution. Employers place a high premium upon such people.

20. A good teacher is one who makes himself progressively unnecessary.

21. Good teaching is not only concerned with what a student knows, but it is also concerned with how he learned it.

22. Teaching is setting a good example, at all times. Proper attitudes are thus caught more often than they are taught in the sense in which we commonly view teaching. Too often, we teach badly the essentials of life. Too frequently, we teach too well those things which should not be taught in the first place.

23. We must choose wisely the things to be taught, and teach them brilliantly.

24. Good teaching is knowing when to leave the student alone.

25. Good teaching is to know when to help the student.

26. Teaching is not a popularity contest. It is a matter of firmness and fairness, coupled with a genuine concern for each student.

27. The good teacher agrees with Arnold Bennett that: "The real tragedy is the tragedy of a man who never in his life braces himself for his one supreme effort, who never stretches to his full capacity, never stands up to his full stature."

28. Dr. Roy J. Crinker, who heads the Institute for Psychiatric and Psychomatic Research and Training at Michael Reese Hospital, would remind teachers that "frustration and anxiety are necessary for learning, growth and maturity." However, continuous failure on the part of the learner leads to prolonged frustration, which in turn can lead to serious mental disorders.

29. The master teacher is more than a subject specialist. While he knows his particular field thoroughly, he also cultivates perspective and relationships. As he realizes the importance of his subject area, he also possesses the necessary vision to articulate his efforts with those of the entire school staff and every community resource in developing the kind of individuals a democracy must have if it is to survive. His chosen subject, his school, community, state, nation, and the world constitute his total sphere of interest. □

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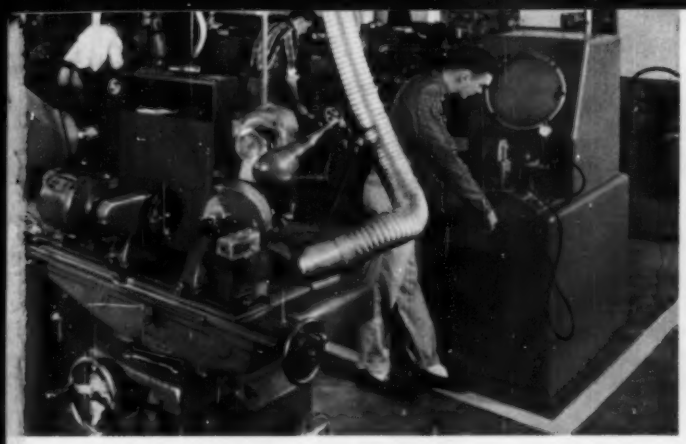
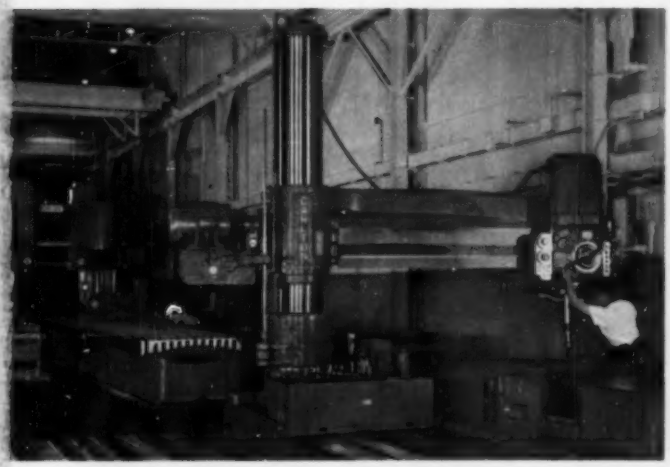


Note how yellow is used to indicate clearly machine controls and aisles in this shop of Morgood Tools, Inc., Rochester, N. Y. Non-critical areas of machines are painted a contrasting green.

In this photo, taken at the Cyril Bath Company, Solon, Ohio, the "warning color," orange, is used on moving objects in work areas. Yellow is again used on aisles, and moving overhead objects.



Here is another example of the way machine operating controls are painted in focal colors which contrast with the non-critical areas of the machine. Photo taken at Buhr Machine Tool Co., Ann Arbor, Mich.

Note the overhead crane, painted bright yellow in this installation at Davis Tool & Engineering Company, Detroit, Mich. This high-visibility color clearly shows moving overhead objects, promotes safety.

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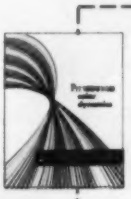

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TEACHER DESIGN

(Concluded from page 28)

project can result in a "busy" appearance. A lamp with a textured base, a textured stem, and a heavily textured shade provides a disturbing amount of contrast. In such situations, the wide variety in form and materials seriously impairs the unified appearance which must be present in objects; in short, the several elements of an article should look like they belong together. The key thought is to provide enough contrast to relieve monotony but not enough to disturb.

One cannot emphasize strongly enough that designing should not be controlled or limited by a specific material, but should be approached in terms of the best possible material to do the job. The limited material areas of industrial arts, if rigidly enforced, can seriously retard proper design thinking. If, in a woodworking class, the solution to a design problem dictates metal as a best material to be used in constructing a project, one should not hesitate to use it. Failure to do so undoes all the good which is manifest in the design, and certainly stifles creative efforts.

Materials, then, should be used simply, directly, and wisely — to the end that the structure is sound, honest, and practical. □

ROUND TABLE

(Concluded from page 20)

suggest the degree of emphasis which each objective merits; others neatly avoid the issue by merely listing the objectives in grocery-list fashion. We need to reflect seriously upon the relative importance of our stated objectives. Obviously, some of our goals are of more importance than others. We need to differentiate those of major importance from those of minor importance. A grocery list or even a rank-order list of objectives is not enough. We need specific guidelines for teachers and others who build courses of study in industrial arts.

It is imperative to review our objectives frequently and to change them as is necessary to keep our program in harmony with that of general education in a society of rapid change. But that is not enough! After our objectives have been stated, teachers need help in their implementation. Some of our present objectives are excellent. They are well-stated, appropriate, and founded upon a sound philosophy of education. The fault lies not with the objectives themselves, but with their improper implementation or lack of implementation. Some teachers seem unable to implement objectives no matter how carefully selected or well stated they may be. They can give excellent lip service to them, but they cannot fulfill them. Teachers need realistic suggestions of specific educational practices to help them attain their goals.

Should the objectives for industrial arts change? Yes, definitely, yes! We need first to agree upon a series of realistic objectives and to decide upon their relative importance. Then we must go one step further by identifying superior educational practices to help teachers and students achieve the stated goals. When this is done, we must be prepared to start all over again for the review and revision of educational goals is a never-ending process. □

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First Prize $300

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☐ *Dr. Donald G. Lux,* after serving for two years in a full-time administrative appointment as assistant dean of the College of Education, University of Illinois, Urbana, has returned to the industrial education division. He was appointed chairman, industrial education division, effective September 1, 1961.

☐ *Dr. Rupert N. Evans,* formerly chairman of the industrial education division, began September 1 as associate dean of the College of Education, University of Illinois.

retirement . . .

☐ *George Frazier,* instructor of industrial arts at Union City, Ind., High School, for forty-two years, has retired and has been succeeded by John Parkison.

awards . . .

☐ *August J. Brezina,* teacher of industrial arts at the Westbury High School, Westbury, L. I., N. Y., completed all requirements for the degree of Doctor of Education at New York University during the summer of 1961.

Dr. Brezina's study, which dealt with the creation of twenty-five original works of sculpture in wood and metal, was done under New York University's new Doctoral Program in the Creative Arts. The program emphasizes performance in the arts such as sculpture, crafts, painting, the novel, pottery, drama, dance, the movement arts, music, the cinema, and television.

deaths . . .

☐ *C. L. Rich,* teacher of physics and mathematics for 25 years at Stout State College, Menomonie, Wis., died unexpectedly at Luther Hospital, Eau Claire, on July 11, 1961.

Mr. Rich was born in Winnebago County, later attending Oshkosh Normal School and majoring in civil engineering at the University of Wisconsin. Because of ill-health, he retired from civil engineering and went into teaching in 1920.

He was principal of schools at Soldiers Grove, Monticello, and Kewascum. He re-entered the University of Wisconsin and came to Stout in 1931, where he remained until his retirement in 1956.

In 1943 he was granted a leave of absence to teach physics in the ASTP program of the University of Wyoming. In 1945 he took a second leave of absence for further graduate study at the University of Minnesota. Mr. Rich was for 40 years a member of the Wisconsin and National Education Associations.

☐ *Karl E. Ludemann,* head of the industrial arts department of Waukesha (Wis.) High School, and 12th Ward supervisor, died on September 10, 1961, at Waukesha Memorial Hospital.

Mr. Ludemann, who obtained his bachelor's degree from Oshkosh (Wis.) State College, and his master's from Marquette University, Milwaukee, had been with the high school since 1922. For the past 33 years, he was in charge of seating and ticket sales for all school athletic events.

He was a past president of the Wisconsin Industrial Arts Association and a member of the Wisconsin Schoolmasters Association, and the Wisconsin and National Education Associations. He was a member of the city civil defense committee and the county board's tax equalization committee.

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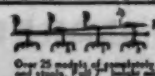

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If you think your students are ready for tips of this type, send a request on a school letterhead for a limited number of "Drafting Shortcuts" which will be sent no-charge. *Address Frederick Post Company, 3648 N. Avondale Avenue, Chicago 18, Illinois.*

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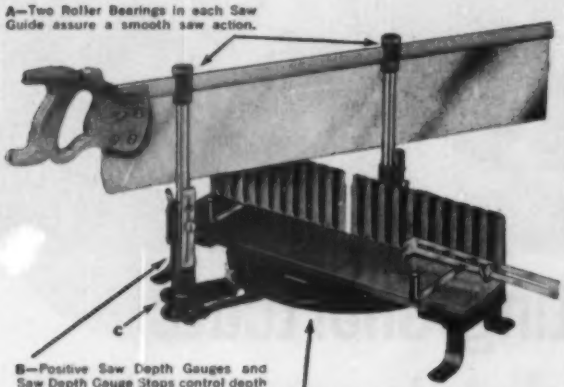

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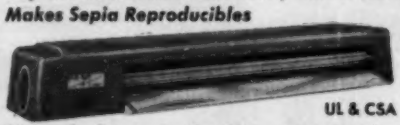

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PROJECT DESIGN

(Continued from page 46)

by industrial arts teachers at both the secondary and college levels. Such experiences arrange themselves along a continuum from a rigid teacher-dominated planning situation to a complete *laissez-faire* approach in which the ill-prepared, unmotivated student looks for an activity to occupy his time. In the former situation, the teacher selects the activity or project, does all or most of the procedural planning, selects stock, and makes most of the decisions. In short, he is the planner, the thinker, the organizer; pupil participation is restricted to following directions and doing. At the other extreme, the pupil emerges as the key figure but he is permitted to wander aimlessly through a series of frustrating experiences in search of a problem to solve. He has no skill, no knowledge, no interest.

And, of course, there are a variety of modified programs between these two extremes. Somewhere there exists the type of program which involves the student directly in the planning experiences pursuant to the execution of his work. He approaches these preliminary activities from a foundation of skill and familiarity with processes and procedures and materials. The problems and activities relative to the construction of the article he approaches with a degree of confidence. When confronted with obstacles, be they his lack of a certain skill or of information regarding materials, he moves ahead to overcome them. When confronted with a choice of directions, he makes his decision by carefully weighing the alternatives. And with the experience completed, he evaluates it in terms of his original problem and its ramifications. Throughout the entire experience, he is guided by the teacher who demonstrates and informs, steering the student in this or that direction in order to help him successfully achieve his goal.

Designing, in this light, becomes an integral part of the problem-solving activities so desirable in the industrial arts program. Designing concerns itself with the matter of *planning adequately* for the construction of some tangible object which meets requirements such as function, soundness of structure, and sensitive appearance. Design cannot, and is not intended to, supplant any established industrial program; it purports to provide more sensitively conceived, more adequate projects and articles, thereby improving and strengthening the total program.

Mention was made of the two extremes in planning activities; the one is as bad as the other. The plea here is for involving the pupil in design activities of an individual or personal nature whenever possible. Starting at the earliest period of organized industrial arts work, some provision should be made for the student to know the joys and satisfactions of creative design.

Factors for Design

Aside from this matter of direct student participation in planning activities, two other factors are significant in building "a case for design."

First, there is the more obvious consideration of public relations and public opinion. The parent becomes familiar with, and aware of, industrial arts offerings primarily through the project taken into the home. In like manner, the yearly school exhibit features row upon row of student-made articles, articles which are up for appraisal by the critical public eye. The evaluation of the quality of that product is frequently made the sole criterion for the evaluation of the industrial program; as biased and unsound as the action may seem, the situation does persist. The parental knowledge of the total program is, at best, sketchy; he or she is uninformed regarding such educational endeavors as forming good habits and attitudes, of developing an understanding of industry, or of promoting consumer knowledge. To them, industrial arts means manipulation or making things or developing skills. They may remember the foot-

(Concluded on page 60)

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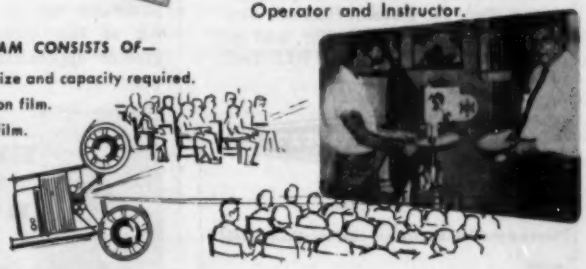

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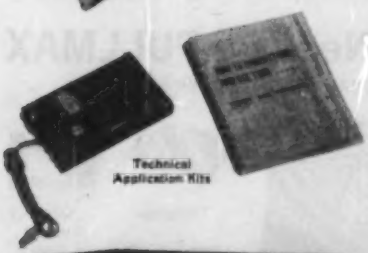

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PROJECT DESIGN

(Concluded from page 59)

stool they constructed in the manual-training classes of their high school years, or perhaps the coin purse they laced. It is small wonder the industrial arts profession is so often placed on the defensive regarding the justification of its curricular policies and offerings.

The situation resolves itself, therefore, to one of confronting the public with well-conceived and well-executed products whenever possible. The very mention of this façade may sound like education heresy. It is, however, not deceitful in any respect; it is simply good public relations. The many other fine aims and accomplishments of the industrial arts classes need not be neglected nor shirked nor de-emphasized. If the parental attitude toward the visible, take-home product is positive and favorable, the result may well be a desire to learn more about the program that produced such a fine article.

There is a second reason for improving the level of design in industrial programs. One frequently neglected educational responsibility is the matter of cultivating taste and developing an understanding of product design for our age. A thorough knowledge of why contemporary products look as they do is prerequisite to accepting and appreciating them.

This obligation does not begin and end with the discussion of contemporary design; it must be extended and presented in such a manner that the individual will recognize and appreciate good design from any period in history. There are logical reasons why the Colonial style carries a very distinctive appearance. There too are reasons why the heavy Mission furniture was a popular and easily recognizable style. To maintain that there is no style other than contemporary would be prejudicial and misleading; one must instead suggest that it is most representative of this technological and machine age, and therefore more adequate for twentieth-century Americans. In other words, design must be viewed in the light of the needs and skills and materials of a particular age. A complete understanding of this viewpoint will lead to a greater appreciation of design in any era. □

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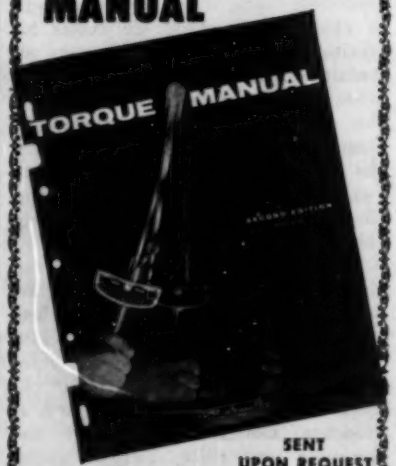

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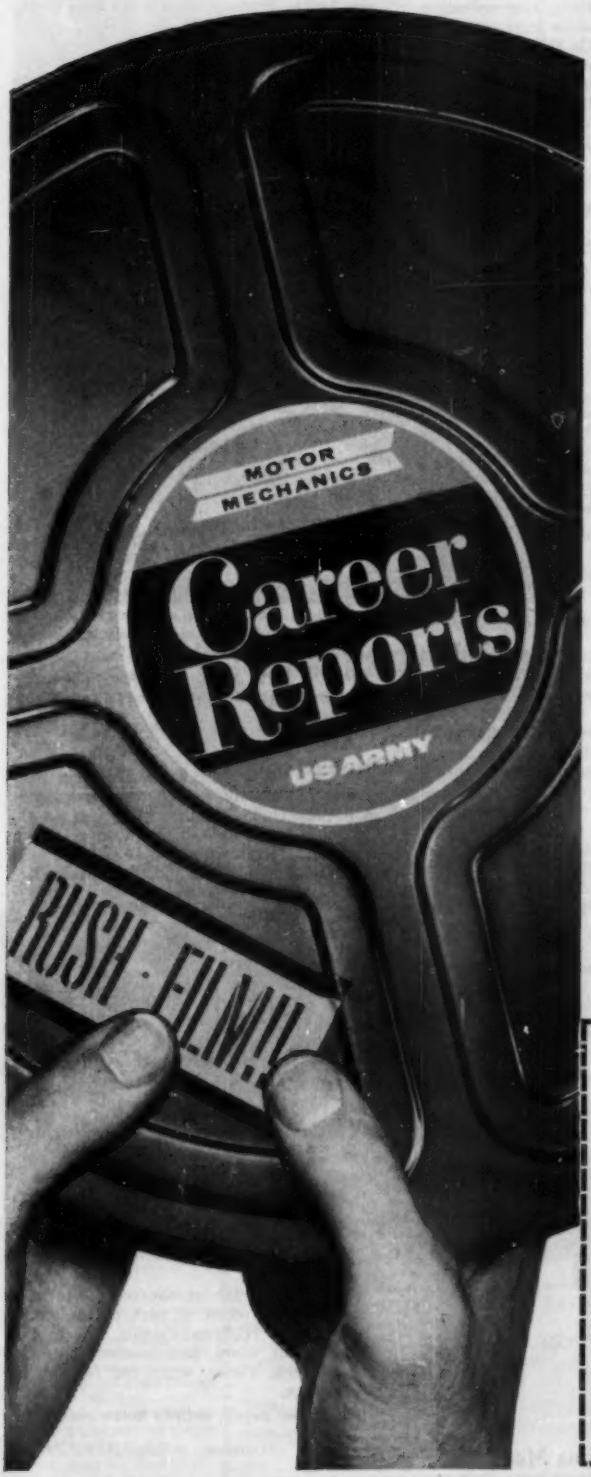

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Who sponsors this project? Career Reports is sponsored by the Department of the Army, with cooperation from the American Personnel and Guidance Association, and other recognized vocational authorities.

What is the Army's purpose? Each film in the series conveys a distinct axiom: training is indispensable to success in any skilled occupation. Beginners can acquire this training in one of several ways—on the job (by means of formal or informal apprenticeship), through a trade school or company training program, or in the Armed Services. The Army's purpose is achieved simply by being recognized as one of the possible ways in which a young man can secure essential vocational training.

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High School_____

Position_____

(For more information from advertisers, use the postcard on page 71)

equipment

power saw From Rockwell Manufacturing Company's Power Tool Division, their lightweight heavy-duty, ball bearing equipped 7-inch Porter Cable Power Saw. The new Model 177 fills the need for a

Model 177 Power Saw

well-balanced power saw with plenty of power and capacity, and is ideal for every type of cutting operation, whether it be light trim work or hour-after-hour heavy construction. It weighs ten pounds, will cut to a depth of 2⅜ inches at 90 degrees and 1⅞ inches at 45 degrees. The 12-amp motor has an idle speed of 4500 rpm. Further information on many additional outstanding features may be obtained by writing to the manufacturer.

(For further details encircle index code 0901)

automatic profile welder From Pullmax AB, Gothenburg, Sweden, a machine — the first of its kind — to produce beams of various profiles by an automatic welding process. I beams, U beams, and T

Pullmax Automatic Profile Welder

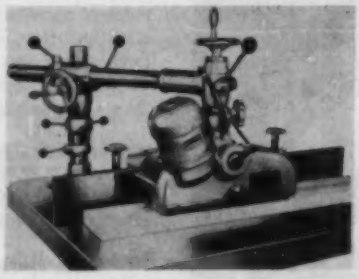
profiles are fabricated by this machine from the desired thickness of plate cut to required width and length. The machine can also be adapted to weld tubes. It consists basically of only three main sections: the feeder, two or four automatic welding units, and corresponding welding generators. The welding method is submerged arc welding. It has a continuous feeding speed up to 5½ f.p.m. maximum; and for some welded profiles savings up to 40 per cent in cost compared with rolled beams can be achieved. A significant feature is that welded beams are "tailor-made" to meet specific requirements and can be produced quickly when needed, thereby reducing stock-piling and storage space of bulky beams of various sizes. For additional data on these welders, send your inquiries to American Pullmax Company, Inc.

(For further details encircle index code 0902)

mounting templates From Columbian Vise & Manufacturing Company, for use with their "Wide-Side" Woodworkers' Vises, and furnished with each V-7 series vise, templates permit pre-drilling of benches and partial placement of fastening bolts before vises are located. Employed in conjunction with Columbian's 3-point mounting, they are claimed to cut installation time by 50 per cent. Their use also assures firm, tight fastening, easy operation, and longer life. Application instructions are printed on templates. On the reverse of the template sheet is a list of operation and maintenance suggestions for Wide-Side Vises. For "Wide-Side" template copies, write to the manufacturer.

(For further details encircle index code 0903)

power-feed conversion attachment From Boice-Crane Company, two new models of their conversion units for easy, and quick conversion of hand-feed working machines to power-feed. Production

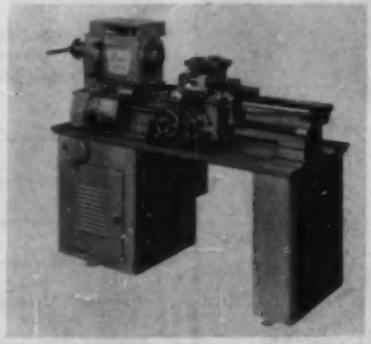


Power-Feed Conversion Attachment

from saws, jointers, band saws, and shapers can be doubled, and frequently by only half as many operators. Two models, with either two or three pairs of feed rollers, which are split to straddle underslung saw blades, and individually spring to automatically adjust to uneven surfaces or work pieces of varying thicknesses. Both models feed in either direction and are powered by enclosed ¾ h.p. motors. The two-roller type provides for 4 speeds and the three-roller for eight speeds. Additional speeds on both are secured by feed rollers available in three diameters. When requesting information, ask for illustrated brochure.

(For further details encircle index code 0904)

chucking machine From Logan Engineering Company, a new eight station turret chucking machine, mounted on



Logan Chucking Machine

super precision, pre-loaded sealed ball bearing to assure accuracy and rigidity. The Chucking Machine features a super precision headstock, super precision spindle, flame hardened bed and ball bearing variable speed drive. It complements the complete Logan line of precision machine tools which include lathes, shapers, and accessories. Further information available from the company.

(For further details encircle index code 0905)

lever-wrench plier From Proto Tool Company, their Lever-Wrench Plier No. 291R. Capable of one-hand pressure up to a ton, the locked jaws of Proto's

Lever-Wrench Plier No. 291R

plier can be instantly released even under maximum pressure. It is four tools in one — a powerful hand-vise, a clamp, a pipe wrench, and a plier. For full information, write to Proto Tool Company.

(For further details encircle index code 0906)

quoin cabinet From Challenge Machinery Company, a newly designed, handy Hi-Speed Quoin Cabinet which fits on the stone or make-up table right next to the regular furniture cabinets. It puts all sizes of Hi-Speed Quoins and the Quoin Key

Quoin Cabinet

within easy reach of the compositor and has room for eight of each of the standard sizes of Hi-Speed Quoins. The cabinet is made of wood, and finished in multitone green. Please write for further information.

(For further details encircle index code 0907)

(Continued on page 65)

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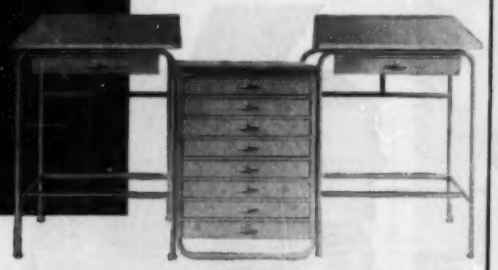

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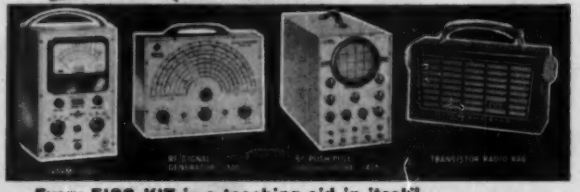

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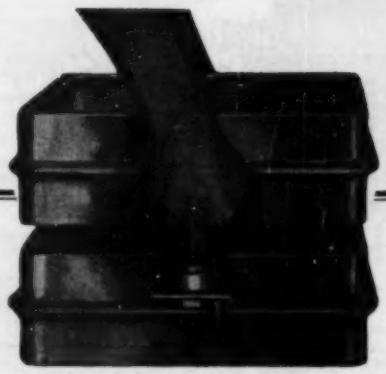

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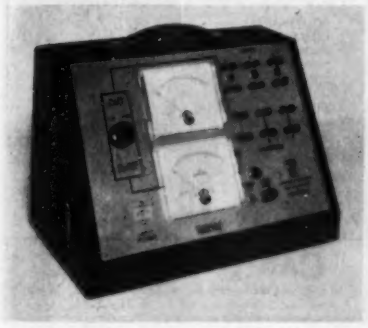
SHOP EQUIPMENT NEWS

(Continued from page 62)

teaching machine From Universal Electronics Laboratories, the announcement of a recent development of the "Lectro-Teacher" Teaching Machine. The Lectro-Teacher is built in the form of a portable



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laboratory to demonstrate basic electrical calculations using Ohm's Law — a precept of physics and electronics. The teaching machine simplifies the instructor's task by translating electrical theory into demonstrated fact, while it increases student comprehension of these principles through the use of easy-to-read dials. Designed to help in understanding difficult circuitry and electrical problems, students at all educational levels, can learn the fundamentals of voltage current, resistance, power, circuit diagrams and symbols, parallel and series circuits, and graphic representation and experimental measurements, at a much faster pace. Further information available.

(For further details encircle index code 0908)

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(For further details encircle index code 0909)

(Continued on next page)

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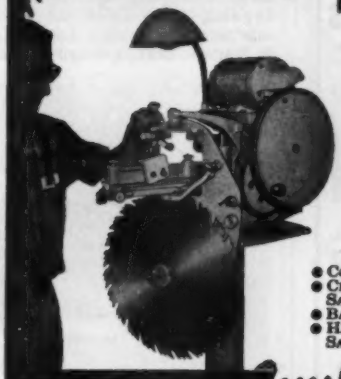

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SHOP EQUIPMENT NEWS

(Continued from previous page)

drawing table From Stacor Equipment Company, the Stacor "D" Series Drawing Table which provides maximum ease and convenience for the draftsman. It features floating-board action, exclusive

Drawing Table with Toe-Touch Control

Stacor Toe-Touch Pedals for complete height (30 to 45 in.) and angle control (0° to 90°) from a seated position, plus a nonglare, washable, self-sealing Lino-Draft top drawing surface. Additional features found in Stacor's "D" Series are modern adjustable floor leveling legs, zinc plated steel end cleats, E-Z access aluminum pencil trough, a built-in bookcase plus Stacor's answer to the need for a product constructed of lifetime service steel. For complete details on this and other members of the Stacor-Matic "Coordinate Group" write to the manufacturer.
(For further details encircle index code 0910)

hi-fi cabinetry From Allied Radio Corporation, a series of furniture ensembles designed for housing stereo music system components. Available in three furniture styles — Danish Modern, French Provincial, and American Colonial modes. Each of these Knight ensembles provides a distinctive setting for a complete stereophonic music system — a centerpiece equipment cabinet, flanked by matching speaker enclosures. Each of the equipment cabinets has swing-out doors with pull handles. Interiors are divided into a top shelf to accommodate an amplifier and tuner, and a divided lower compartment for record changer and record storage. Over-all size: 33 in. high, 36 in. wide, and 20 in. deep. Speaker enclosures accommodate a 12- or 15-in. speaker (12-in. speaker or 15-in.

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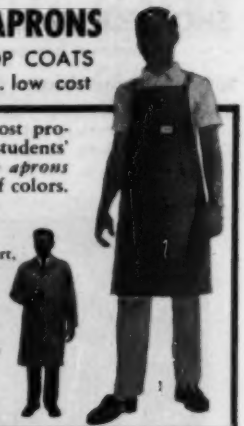

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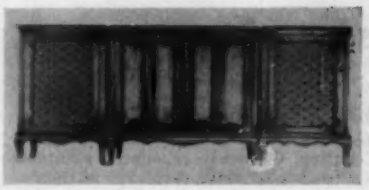

French Provincial Model

woofer in the Danish Modern group), with room for adding 2- and 3-way system components. Speaker enclosures approximately 33 in. high, 25 in. wide, and 20 in. deep; two are required for stereo music systems. The French Provincial ensemble shown features the Model KN-1501 equipment cabinet, styled in the "light line" look. Available only as an assembled cabinet, in fruitwood veneer, it is listed under Stock No. 35 DZ 717, and its matching speaker enclosure, the Model KN-1276, is listed under Stock No. 35 DZ 723.

(For further details encircle index code 0911)

variable frequency oscillator

From Electronic Instrument Company, Inc., their new self-powered, VFO providing full coverage of the ham bands from 80 to 10 meters (10 meters covered in two ranges). EICO Model 722 features anti-backlash tuning, a low-heat silicon diode doubler power supply, a buffer-multiplier output stage, a very large and

EICO Model 722 VFO

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(For further details encircle index code 0912)

epoxy-metal compound

From The Borden Chemical Company, their specially designed compound, resistant to most acids and alkalies, waterproof and oilproof, can be machined, filed, sanded, drilled, or tapped. Used to fill, bond, and repair steel, iron, aluminum, bronze, brass, lead, tiles, concrete, brick, marble, ceramics, porcelain, wood, glass, leather, fabrics, and most hard plastics. Called Elmer's All-Purpose Epoxy Metal Compound, the new product is a two-part system consisting of metal-filled resin and hardener. Each unit consists of a can of metal-filled epoxy resin and a can of hardener which mixes to double the amount of the unit size. Further information on sizes available, prices, etc., may be obtained by writing to the manufacturer.

(For further details encircle index code 0913)

(Continued on next page)

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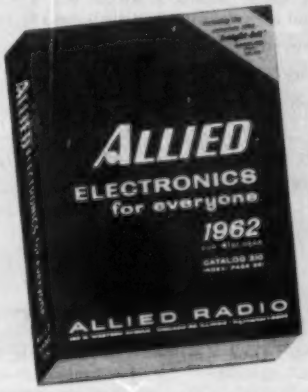

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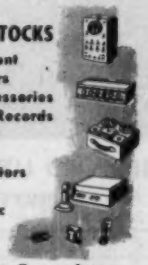

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SHOP EQUIPMENT NEWS

(Continued from previous page)

microfilm reader-printer From Recordak, subsidiary of Eastman Kodak Company, the newly announced Recordak Reader-Printer which operates with 16mm. or 35mm. film in roll form, in aperture

Recordak Reader Printer

cards, or in card-size film jackets. The unit is fully automatic in operation after print button is pressed. Complete processing of print takes approximately 45 seconds, but reader can be used for viewing after 25 seconds. Cost per print, including chemicals is approximately 9 cents. Print size is 8½ by 11 in. with an image area of 7 by 9¼ in. It fulfills a long felt need for a compact, moderately priced dual-purpose reference unit. Images are enlarged up to clear and sharp readability on the self-contained 11 by 11-in. screen. When a paper copy is desired, it can be ready for use within 45 seconds. Further details available.

(For further details encircle index code 0914)

ozium vaporizer From Woodlets Inc., comes a new method of air treatment — the No. 2500 Ozium Vaporizer. Odors and smoke are noticeably cleared up when these Ozium vapors are released. The Va-

Air Sanitizing Vaporizer

porizer is constructed to continually release sufficient vapors to provide treatment for an area up to 2500 cubic feet. One pint of Ozium Concentrate will last 30 days, running continuously night and day. An innovation that should prove a boon in schools, and other institutions where air circulation is desirable, the cost per day is less than ten cents. Further details can be obtained by writing to the manufacturer.

(For further details encircle index code 0915)

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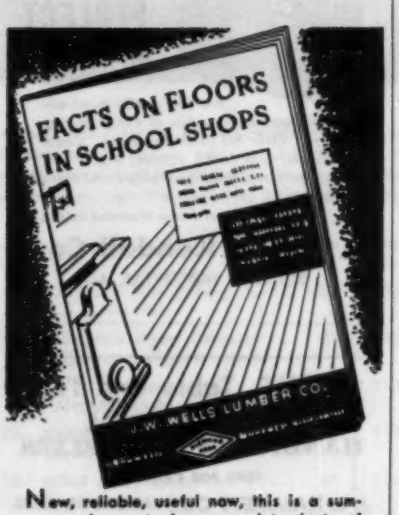

New, reliable, useful now, this is a summary of reports from superintendents of 57 major school districts on the kinds of floors they now have — floors they prefer, — for each of 8 major shop areas, woodworking, metalworking, printing, etc. (Survey made by Industrial Arts & Vocational Education Magazine, 1959.)

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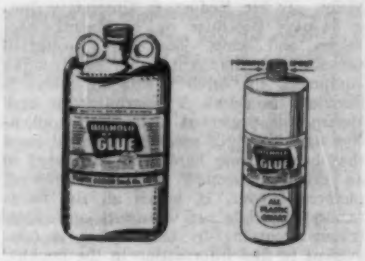

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containers pour easily when refilling small sizes of Wilhold Glue-Birds and re-seal in a jiffy. Containers can be cleaned out for re-use around the shop or home. For more information write to the manufacturer.

(For further details encircle index code 0916)

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(For further details encircle index code 0917)

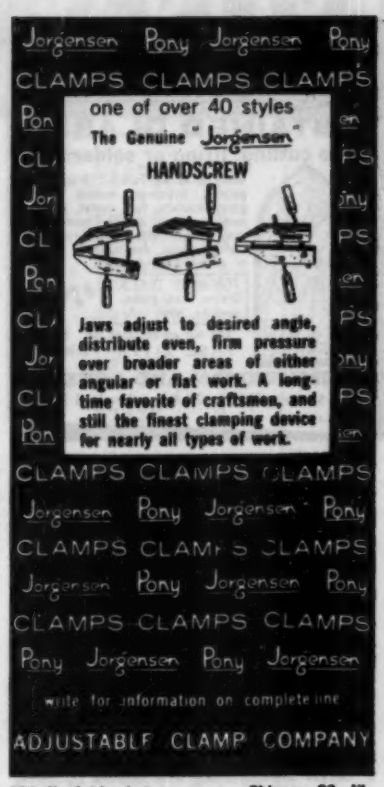
DESCRIPTIVE MATERIAL

From South Bend Lathe, Inc., their two-color 8-page catalog (No. 6106) currently featuring their complete line of presses, 30, 50, 75, and 100-ton Hydrolair and the 30-ton Hydraulic Laboratory. Specifications on all Air Powered Hydrolair and Hydraulic Presses, hot plates and accessories are listed in separate sections in detail for reference. Color diagrams of the "Power-Petuator" air-hydraulic intensifier provide a clear explanation of this unique, patented feature. One section is devoted to the 30-ton bench type laboratory press. Price sheet for presses, optional features, hot plates, and accessories will be sent along with the free catalog, upon request.

(For further details encircle index code 0918)

From Brown & Sharpe Manufacturing Company, their 20-page bulletin giving complete specifications and including illustrations covering the principal construction features, operations, and optional accessory equipment for the four new Micromaster Surface Grinding Machines. The sizes of machines covered are the 8 by 24 in., 10 by 24 in., 12 by 24 in., and 10 by 30 in., all of which include many new features for close tolerance tool and die shop or production work. Bulletin GM 62, free.

(For further details encircle index code 0919)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(Concluded from previous page)

From Air Reduction Sales Company, a division of Air Reduction Company, Inc., a 44-page brochure on hardfacing electrodes and wires. The wear protection provided on industrial and construction equipment by Airco hardfacing alloys is discussed in detail. A description of each electrode is presented along with application data. Over 100 specific equipment parts that benefit from hardfacing are listed in an extensive section. A cross-referenced, pictorial layout, in which all the hardfacing materials are classified and illustrated according to use, makes it convenient to find information in the booklet. When writing for your copy specify form ADC 955.

(For further details encircle index code 0920)

From Craftools, Inc., the new 24-page catalog on ceramics, containing a wide range of potters wheels, sprays booths, ball mills, jars, damp and dry cabinets, plus a comprehensive selection of quality tools. All items are described and illustrated. A copy of this catalog is available free to schools, institutions, and individuals requesting it on their letterhead.

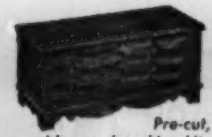
(For further details encircle index code 0921)

From Barap Specialties, newly published 16-page catalog illustrates and describes new products added to its line: wood and metal legs, hardware for legs, lamp parts, veneers, Swiss musical movements, lazy Susan bearings, rocker springs, and many others. Catalog free to instructors; ten cents to students.

(For further details encircle index code 0922)

From Wilton Tool Mfg. Co., Inc., revised price sheet entitled "Industrial Users and Dealers Price Sheet No. 40," which lists revised prices on two models of their milling machine vises and the Low-Boy PowRarm work positioner; also four models in Wilton's woodworkers' vise line; new, super duty C clamps with full closing spindles; two PowRlock hydraulic heads; three Midget PowRlock holders; complete assemblies for the Midget PowRlock and the miniature PowRlock; and the new "640" utility vise series. Copies of the revised price sheet may be obtained by contacting the company.

(For further details encircle index code 0923)



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